Chemical Age

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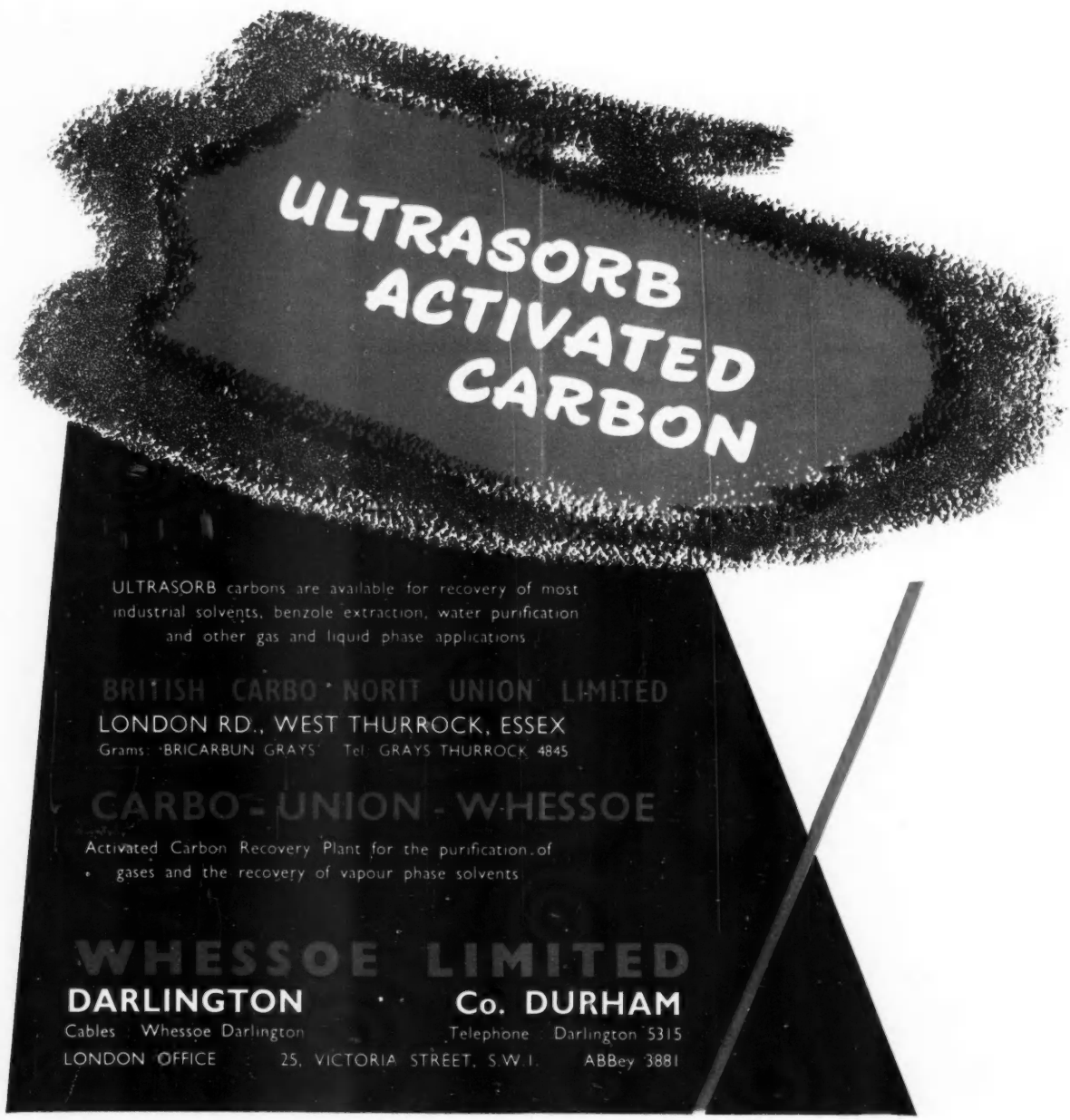
VOL. 78 No. 1982

6 July 1957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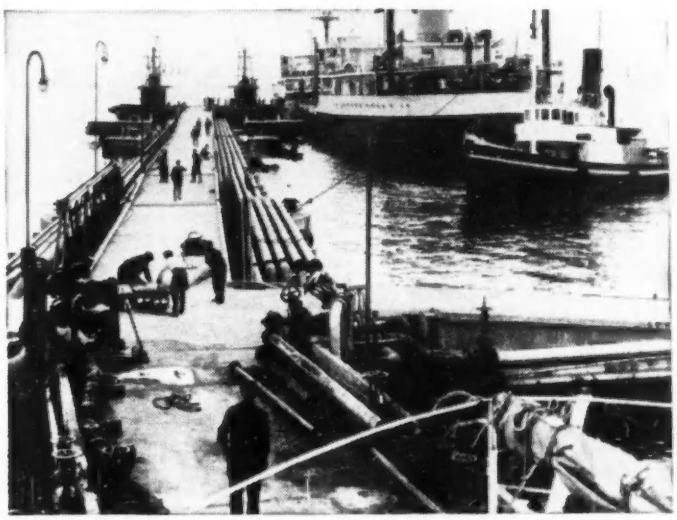
preventing corrosion of steelwork and installations of a new oil wharf

The new oil wharf at La Spezia, in Italy—built to serve the refinery of the Soc. L'Industria del Petroleo, Genoa —is wide open to the multiple attack of salt-laden winds, heavy rainfall, sea water, crude oil and tanker effluents. The protection of its steelwork, pipe lines and storage tanks was a formidable problem.



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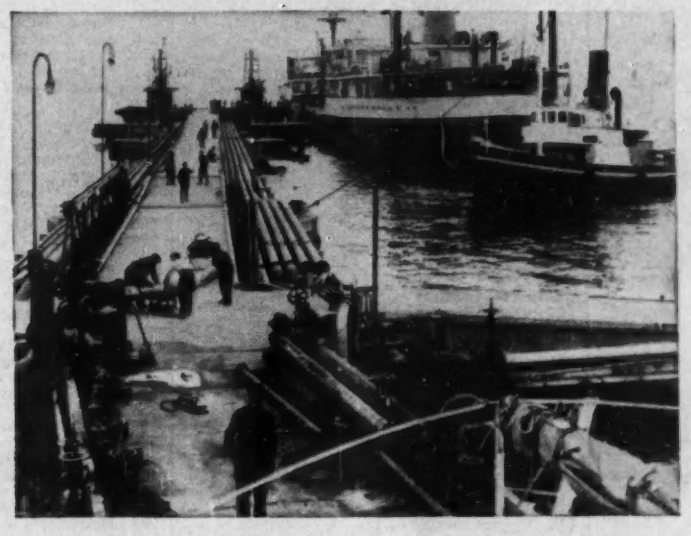

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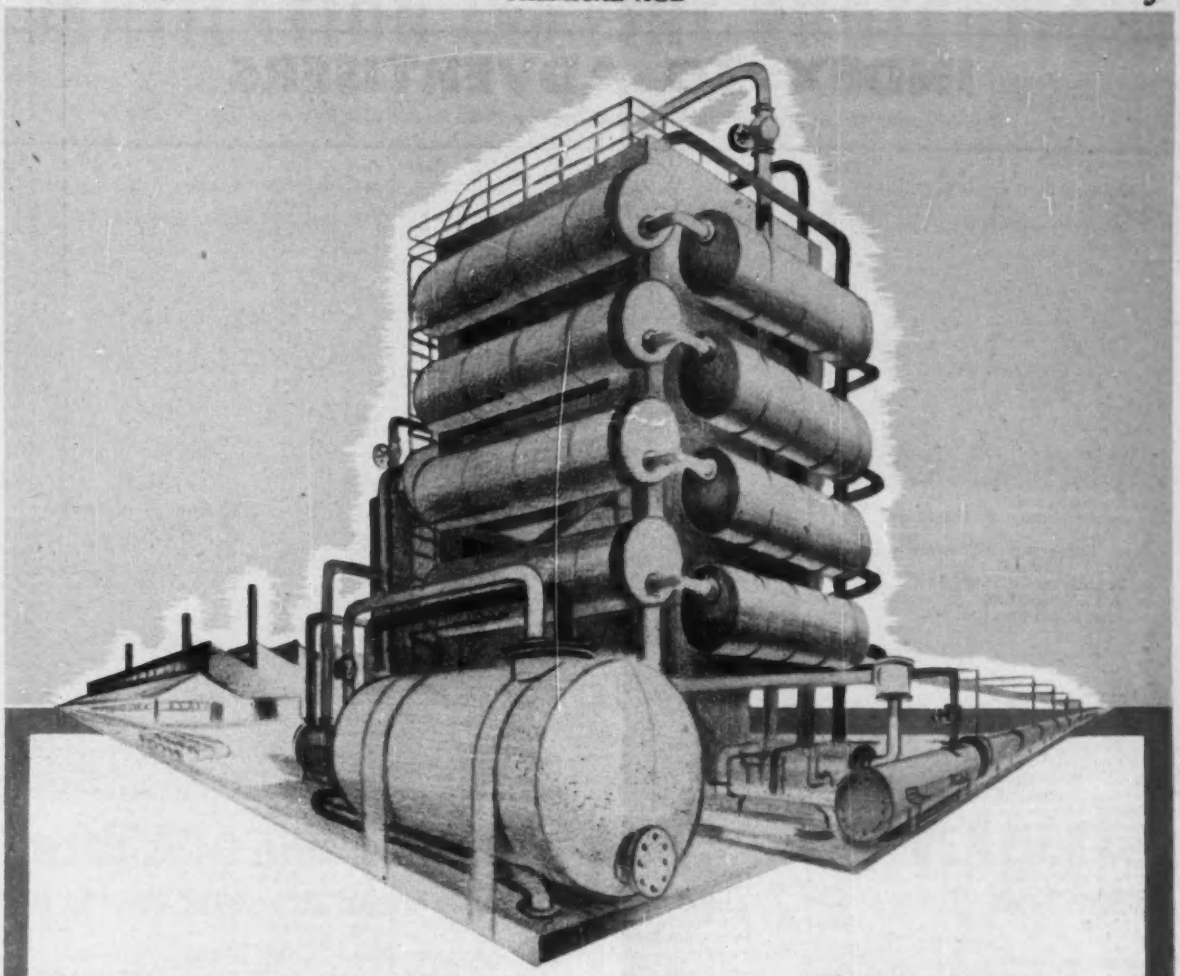

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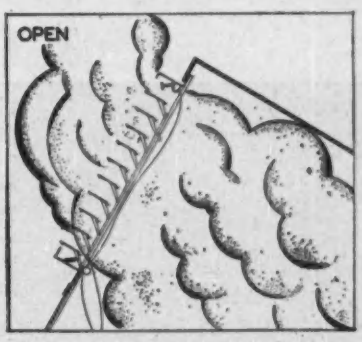

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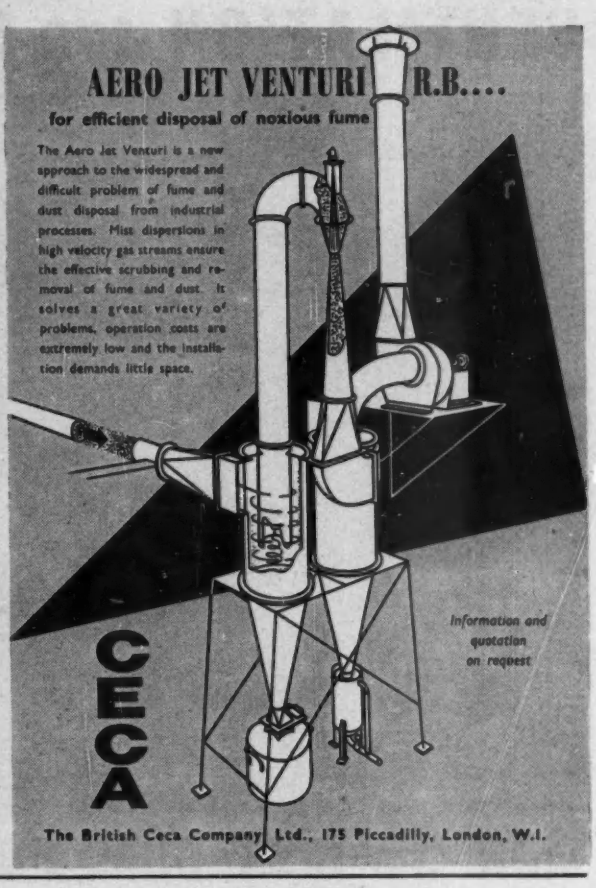

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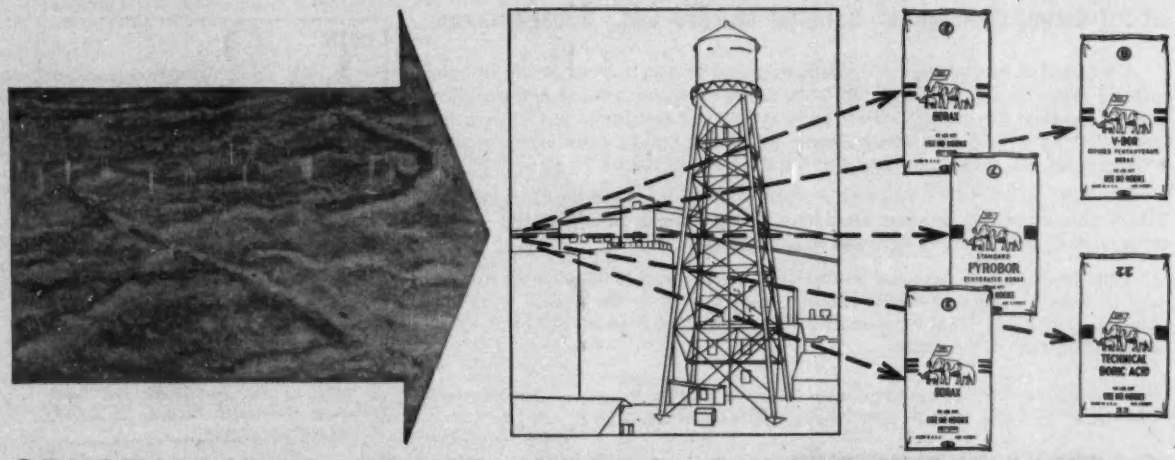

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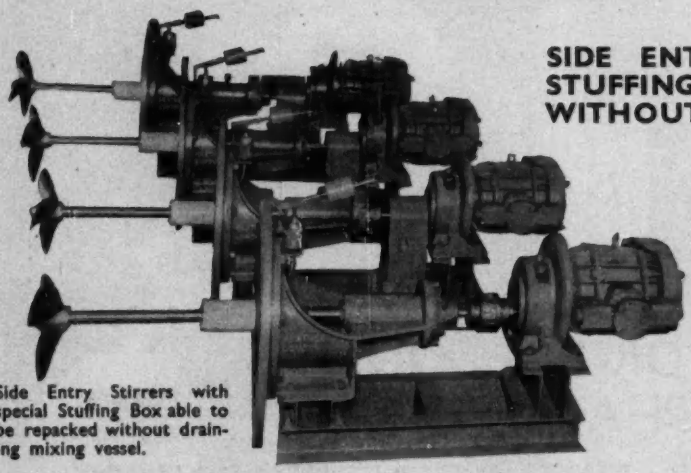

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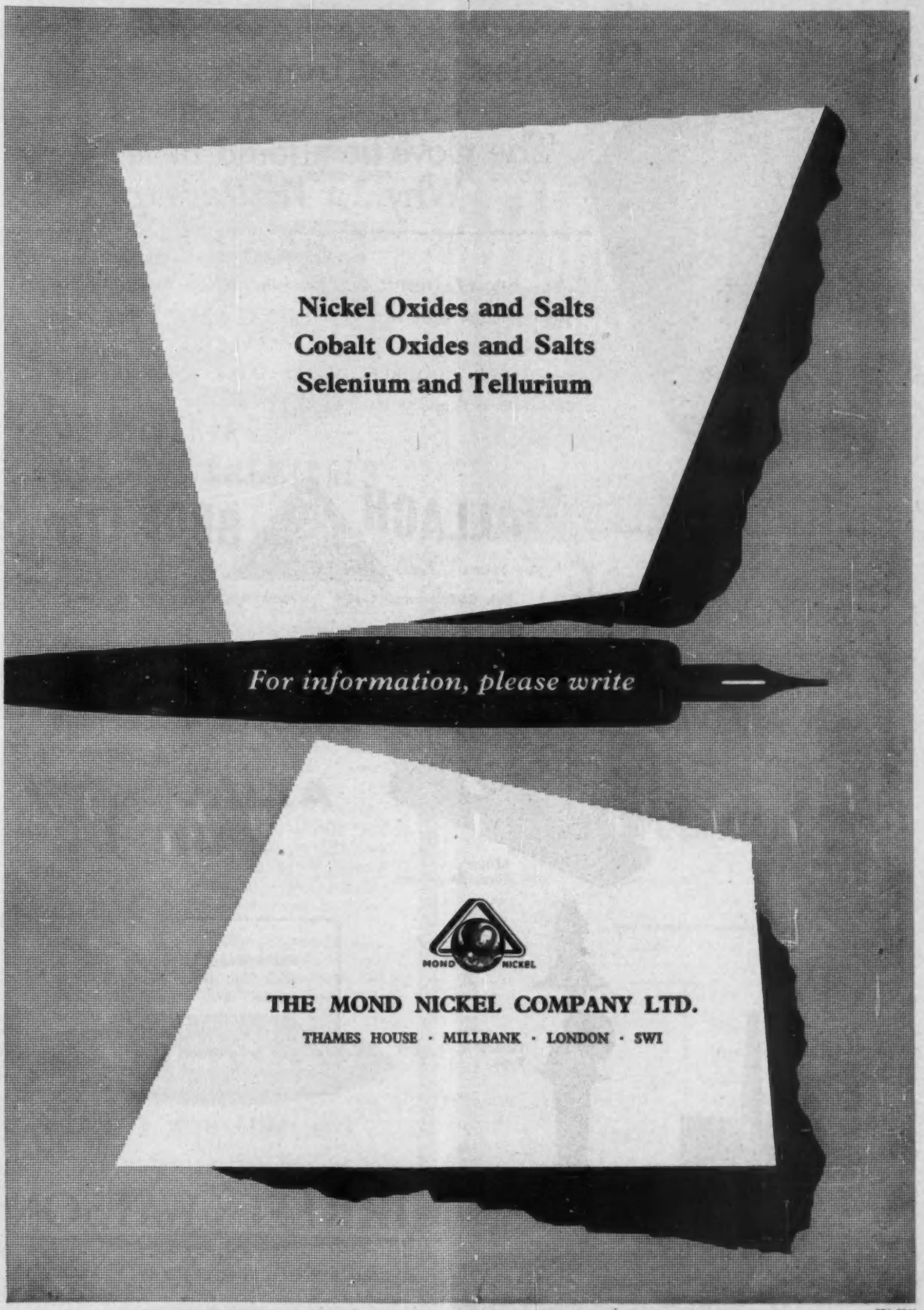
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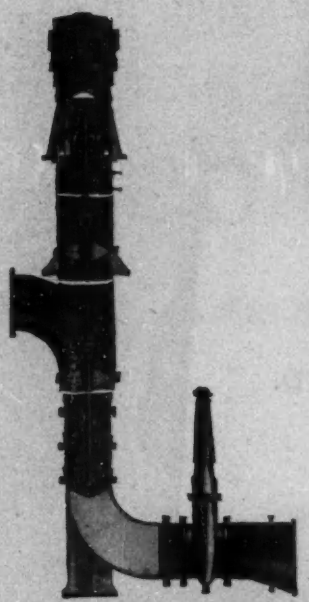

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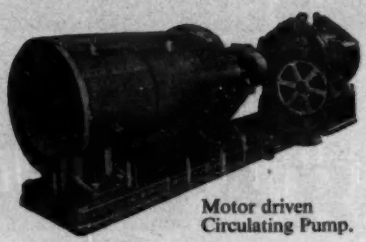

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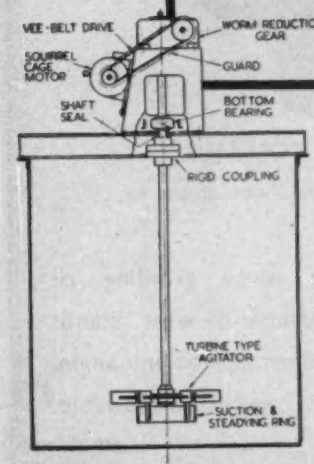

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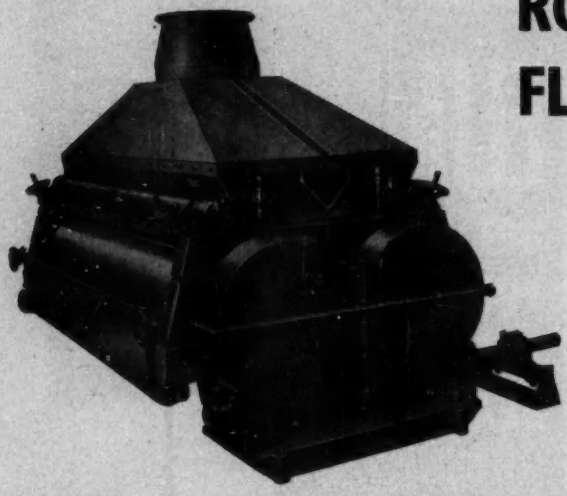

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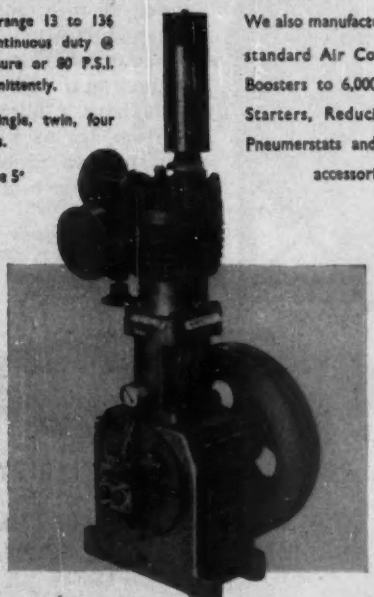

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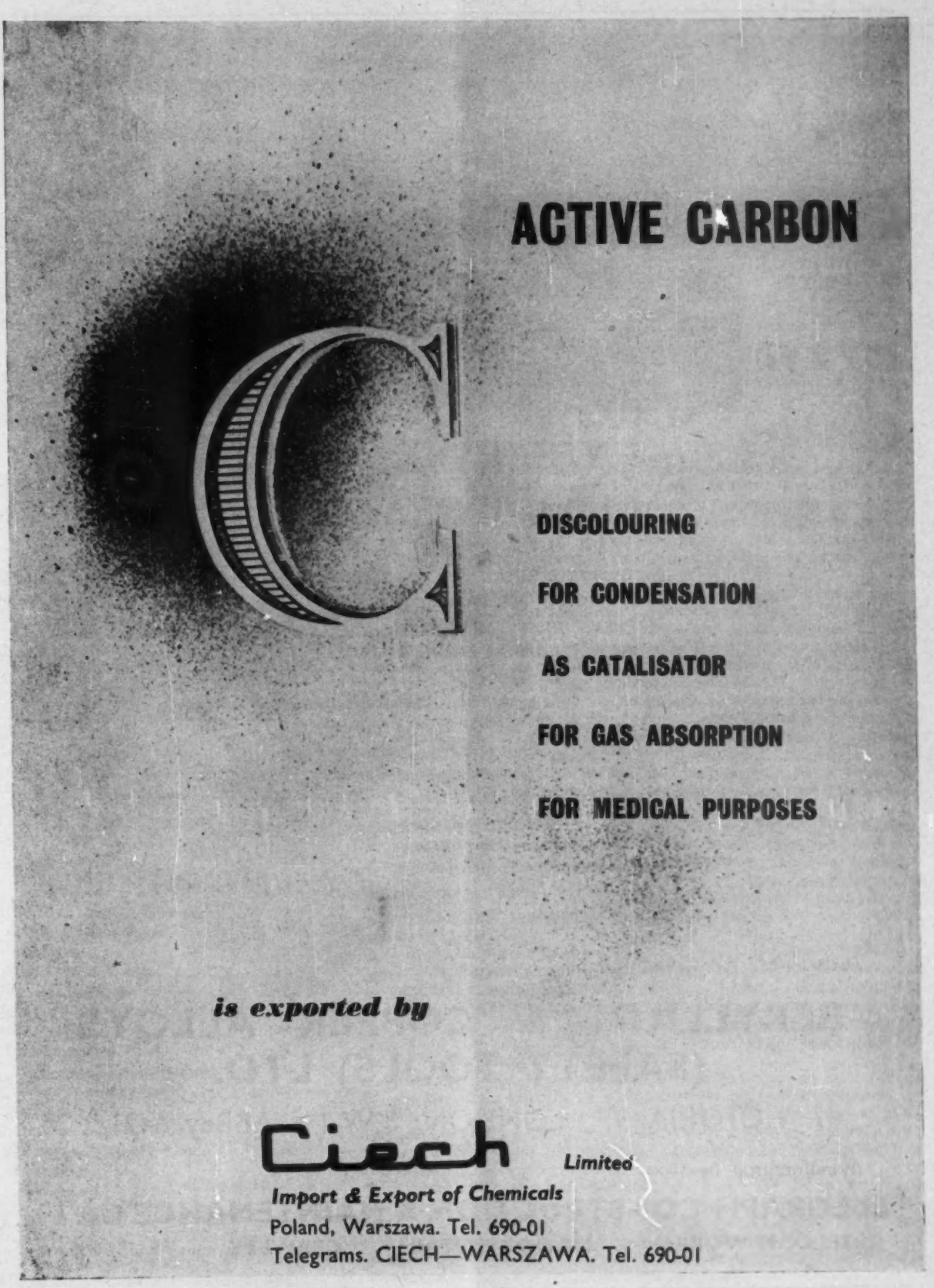
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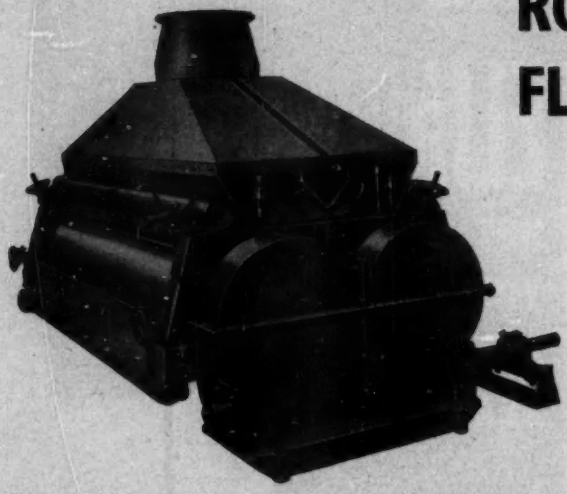

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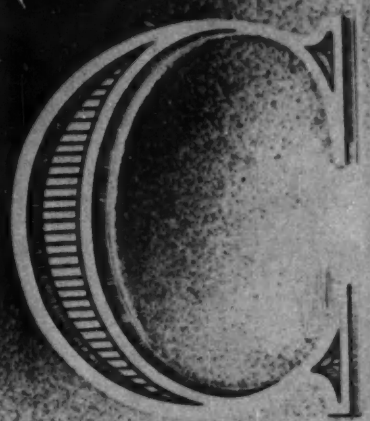

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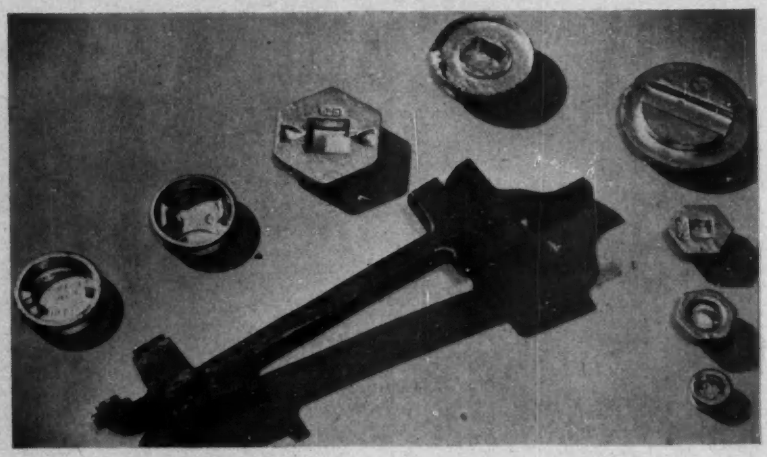

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CHEMICAL AGE

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CHEMICAL INDUSTRY'S LEAD

PRODUCTION in all major British industries is now going ahead. Output in May was the highest ever recorded for that month and the highest for any month since 1955. The first quarter's figures for this year show a 6 per cent increase in output compared with last year, and in March the chemical industry became the first major industrial group to double its 1948 output. This is recorded in the provisional production figures issued by the Central Statistical Office.

There is little doubt that, since March, production of most chemical groups has been forging further ahead. It is likely that in the second half of this year the index of industrial production will produce new records. Exports, too, have been keeping pace with the higher production and in April–May shipments of chemicals, at nearly £24 million, showed a striking increase of 15 per cent over last year and were 5 per cent up on the first quarter of 1957.

But these healthy economic trends are being offset to some extent by shortage of capital and lower profit margins. Understandably, it is the largest industrial concerns and the nationalised industries which are continuing with their investment plans. Thus Imperial Chemical Industries Ltd. plan to spend £100 million on a new works to produce chemicals from oil on Severn-side by the middle-'70s. Other chemical concerns are also to spend large sums in erecting new plant and in expanding and re-equipping.

In financial circles, the view is that there is need for a balanced view of investment priorities, with a strong bias in favour of productive investment, since only a rising production could support it. Undoubtedly the inflationary tendencies of the past few years will continue for some years to come. But if the rate of growth in the next 10 years is along similar lines as indicated in the current index of production, the index should reach the 200 mark by 1968, that is, double the level of 1948.

Since chemicals are now the leading industry, having passed the 200 mark last March, they should gain still further. The increasing trend towards full automatic plant control that is gaining ground in the chemical industry will help in the struggle to maintain profit margins, but if many chemical concerns are not to show poorer results in the next 12 months, particularly as they are faced with dearer coal, electricity and freight, the rate of productivity increase will have to be stepped up fairly quickly.

This is no easy task, for any substantial increase in productivity can only come by the large-scale adoption of work study and the implementation of full automatic plant control. Automation is a relatively simple matter in the engineering of a new plant, but to re-equip an existing plant, probably built many years ago in what are fast becoming highly unsuitable buildings for such modernisation, is an extremely costly operation.

Increased sales overseas are also part of the answer and UK participation in a European free trade area would help most chemical companies, but it will be many years before the full benefits of this project can be expected.

Relaxation of the penal rates of taxation would certainly benefit the chemical industry, particularly as it continues with such vigorous development. A higher investment allowance is, for instance, long overdue.

The next decade will see many sweeping changes and vast expansion projects;

this progress is world wide, with many former chemical purchasing countries spending liberally on developing their own industries. The UK chemical industry, however, is still on the threshold of great developments and there is no doubt that undoubtedly she can maintain her position in the forefront of the world's chemical industry.

PHTHALIC ANHYDRIDE

REMOVAL of Key Industry Duty from phthalic anhydride shows that the UK producers are still having trouble with their plants. This duty has been imposed, revoked and reimposed more than once during the past few years. Since UK capacity when fully occupied is more than sufficient to cope with home demand, this periodical change in the incidence of KID is an indication of conditions at the main plants.

The latest removal, dating from last Friday, can be taken to indicate that the UK producers are still meeting difficulties. This is not surprising as phthalic anhydride is extremely difficult to produce. The troubles that have been encountered by manufacturers in this country have also been experienced abroad. It is unlikely that ICI's 15,000-ton fluidised bed plant has ever worked at full capacity for very long at any given time.

These difficulties have, of course, led to the representations that have been made by the plastics industry for the removal of the duty. Until UK capacity plant is either increased or is working at full capacity there seems no alternative, but as a long-term policy this continual removal and reimposition of KID must be deplored. Certainly it gives no hope of a stable market for foreign producers, for no sooner do they establish reasonable contact with customers in the UK than they find their market cut off by the reimposition of a 33⅓ per cent duty.

At present, both US and West European capacity for phthalic anhydride is forging ahead; in 1955 US production totalled 350 million lb., an increase of 38 per cent over 1954. By the end of this year output is expected to be in the region of 376 million lb. European capacity, 207 million lb. in 1955, is expected to be nearer 330 million lb. by the end of 1957.

Any substantial increase in phthalic anhydride capacity is likely to create a shortage of naphthalene, production of which remained static for some years until 1954 at about 40,000 tons a year. In 1955 it increased to 50,000 tons and last year rose to 52,000 tons. Although producers have only the cost of new plant to consider when considering higher output, there is little incentive to increase capacity because, to the producer of coke, naphthalene is but one by-product and it is by no means sufficiently important to permit adjustment in process volume.

Coal hydrogenation as an alternative source is no doubt too costly; so it appears that the petroleum industry is the next most likely source. Since coal-tar naphthalene is currently so cheap, with UK naphthalene selling in the US at a c.i.f. price of 5 cents a lb., any development of the recovery of naphthalene, or the more plentiful methyl naphthalene, from the high fractions of heavy reformate, is largely a question of economics.

It is interesting to note that one of the few companies currently producing naphthalene from petroleum is Petrochemicals Ltd. at Partington.

JAPAN'S CHEMICAL EXPANSION

AN OBSERVER recently returned from Japan, Dr. R. S. Aries reports that chemical industry in Japan is growing at the rate of 15 per cent a year, compared with 10 per cent a year in the US. A survey of 100 Japanese chemical companies indicates that they will spend $500 million in 1957 and 1958 for new installations.

Japan today has the aid of the technological assistance from other countries, particularly the US and UK. It can therefore manufacture practically everything up to international standards. It is perhaps surprising to learn, for instance, that Japan makes the purest titanium metal in the world, and the most refined silicon known commercially. It is reported that this silicon has impurities of one part per billion and is excellent for transistors.

In the world's plastics production, Japan now ranks fourth, currently producing 340,000 tons of products. In fact, such is her rate of progress that in 1959 she may well be ahead of Great Britain and only slightly behind West Germany. Over the last five years exports of plastics, in particular, p.v.c., have been doubling every year. Under licences from the US and Western Europe, four new polythene plants are being built or designed.

Japanese chemical engineers working on Ziegler's high density polythene process have carried out all the development work and a large plant is in production. This achievement is outstanding since many US companies have not been able to accomplish the same as quickly and efficiently. In like manner, the Japanese have developed original processes for urea, hydrocyanic acid, vinyl pyridine and many other plastics raw materials.

This belies the belief that the Japanese chemist is merely a follower and adapter of foreign processes. He is, in fact, an ingenious and creative innovator.

Impressive postwar progress is recorded of the Japanese fertiliser industries. This is undoubtedly due to the need for increasing the yield of its restricted land area. Ammonia sulphate production is estimated at four million tons for this year, some 2.5 times the 1950 output. Exports are increasing rapidly and by 1960, it is believed, will account for 50 per cent of output.

At the present time Japan is the world's largest urea producer. In 1956 production was 290,000 tons (double that of 1954). Estimates based on plants being built or engineered, indicate production should rise 30% per year until 1960. Phosphate fertiliser exports this year are expected to reach about 350,000 tons.

After fertilisers the next largest segment in Japanese chemical production is the pharmaceutical industry. Last year, sales of pharmaceuticals were over $300 million. Expansion in this industry has received considerable impetus from contributed US know-how. In this industry, however, only four per cent of production is being exported, compared with 30 per cent in 1939. This is due to the present prosperous national economy and the improved social welfare and sanitary arrangements. Major export items in pharmaceuticals are vitamin B., vitamin C., sulphonamides and streptomycin.

In the petrochemical field, Japan has recently received considerable know-how and licences for US processes. It will also be recalled that early this year two Japanese synthetic fibre manufacturers concluded agreements with I.C.I. Ltd., for the manufacture of polyester fibre (Terylene). At that time, we said that UK manufacturers should turn their eyes eastward and reflect carefully on Japan's chemical industry activities. We reiterate those sentiments. Even the US is noticing that trade between herself and Japan is gradually equalising. Today Japan is buying about $200 million worth of goods more from the US than she sells to that country. Two years ago, however, she imported $400 million more from the US than she exported to it.

BP AND BAYER FORM JOINT PETROCHEMICAL COMPANY

A JOINT company for the manufacture of petroleum chemical products is to be formed by BP Benzin-und Petroleum-GmbH, the German associates of British Petroleum Co., and Farbenfabriken Bayer, of Leverkusen, Germany. The two companies will each have 50 per cent participation in the new company.

The British Petroleum-Farbenfabriken Bayer project for formation of a joint subsidiary for the manufacture of petroleum chemicals in the German Federal Republic briefly concerns a works complex at Dormagen, near Neuss on the Lower Rhine, on which Farbenfabriken Bayer have been working for several years.

Since the main site of the Bayer company at Levekusen has been almost fully developed, the most important new productions in the organic chemicals field have of late been concentrated at Dormagen where work on a cracking plant capable of dealing with 60,000 tons a year of crude oil or any light or heavy fractions for the manufacture of olefines and diolefines has been in progress since April last. This plant is scheduled to go on stream in the second half of 1958.

The process employed at Dormagen is based on the Lurgi-Ruhrgas cracking process but has been further developed and tested on a pilot scale by Farbenfabriken Bayer; construction work on a large-scale plant was originally to have started last year but it was stated only in the annual report for 1956, published in May, that the preparatory work at Dormagen had been concluded. The throughput capacity of 60,000 tons a year corresponds to an output of 15,000 tons of ethylene. Propylene, butylene and butadiene will also be produced, and special flexibility is claimed for the process employed. Starting materials for many intermediates and organic products will be available, and most of these will be made in new installations already being built or to be erected on the Dormagen site.

BP Hold Half Share

British Petroleum hold a 50 per cent interest in the new company through its German refining and distributing company, BP Benzin-und Petroleum-GmbH. Its interest in the new enterprise is threefold: First, the raw material for the new plant is to be supplied by a new BP refinery to be erected in the Rhine-Ruhr area, and total consumption of oil products at the Dormagen plant may eventually rise to 300,000 tons a year. Second, the 50 per cent participation in the project stated to involve total capital expenditure of DM 240 million equal to £20 million, represents a very important financial interest. Third, British Petroleum have played an active part in the development of the petroleum chemicals industry and stand to benefit technically from the experience gained in the German plant.

For Farbenfabriken Bayer co-operation with a leading British oil group is especially valuable, not only insofar as it assures the new plant of a regular source of raw materials but also because it reduces the capital cost and financial risk and secures access to the valuable 'know-how' of British Petroleum in the petroleum chemicals field.

The total capital expenditure of DM 240 million, envisaged at the new Dormagen plant, is of about the same magnitude as Bayer's annual outlay on new plant and extensions (DM 236.4 million in 1956). The financial problem facing Bayer is therefore formidable. Bayer's expansion programme in the field of heavy inorganic chemicals, organic intermediates, plastics and photochemicals which absorbed huge sums in recent years has however been substantially completed and the Dormagen project represents logically the next step in the bulk production of organic products based on petroleum.

1958 OCCA Exhibition Arrangements Completed

PRELIMINARY arrangements for the Oil and Colour Chemists' Association 10th technical exhibition, 1958, have now been completed. Announcing this, the London section exhibition committee states that the exhibition will be held in the New Hall of the Royal Horticultural Society at Greycoat and Elverton Streets, London SW1, on 11, 12 and 13 March 1958. An exhibition luncheon will be held at the Criterion Restaurant, London W1, on the first day.

Theme of the exhibition will be the presentation of technical advances in those industries supplying the paint, varnish, printing ink, linoleum and other allied industries. As in previous years, there will be no charge for admission made to either members or visitors.

Closing date for receipt of applications for stand space will be Friday 6 September 1957. Copies of the 'Invitation to Exhibit', which gives details of the completely revised shell scheme which will be used for the exhibition, have already been dispatched to many companies.

UK and Continental companies wishing to be considered for stand space should write to Mr. R. H. Hamblin, general secretary, at Memorial Hall, Farringdon Street, London EC4.

ICI Plan £100 m. Petrochemical Plant at Severn Site

PERMISSION to develop a site of 1,000 acres on the Severn in the Thornbury rural district for the production of organic and inorganic chemicals is being sought by Imperial Chemical Industries Ltd. If permission is granted, the total amount invested in developing the site between now and the mid-1970s may well be in the region of £100 million state ICI.

This ultra-modern chemical complex will employ the latest developments in chemical technology and its plants will largely rely on oil as their main raw materials.

One of the factors influencing ICI in their choice of the site has been the availability of good port facilities. Various oil products would be needed in large quantities for the operation of the processes planned. It is hoped that tankers of 30,000 tons capacity would bring oil direct from the oilfields and the refineries.

The new site will, in many respects, resemble ICI's Wilton Works in North Yorkshire, where already more than £70 million has been spent since 1945 on the development of a complex of plants manufacturing products as diverse as Terylene polyester fibre and raw titanium.

Most of ICI's existing installations for the manufacture of organic chemicals, including plastics, and ammonia products such as heavy industrial nitrogen chemicals and fertilizers, lie in the north of England. A large proportion of the consuming market is, however, in the Midlands and south. The new factory will be in a good position to supply this market. The site is favourably located for both road and rail distribution to the whole area.

Nevertheless, the planned capacity of the plants would be such as to permit a substantial part of total output being sold abroad. The direct and indirect contributions to Britain's exports, taken together, would be considerable—because many of the products would serve as raw materials for other exporting UK industries.

As at Wilton, extensive use will be made of automatic control, so that productivity and capital investment per man employed will be high. The new works will, therefore, make a relatively small demand on the nation's manpower. It is estimated that the total operating force in the 1970s will be between 4,000 and 5,000, and the capital employed per man between £15,000 and £20,000.

The Severn-side site, like Wilton, will be a piece of modern industrial architecture whose appearance should in no way mar the natural surroundings and whose gradual expansion would greatly strengthen the local economy. Possession of the land needed for development will be programmed in phases; as a result, much of the land to be acquired will remain in agricultural use for some years.

Titanium Dioxide Duty

The Import Duties (Exemptions) (No. 7) Order, SI 1053, 1957 which came into effect on 27 June, continues for a further six months the exemption of titanium dioxide from duty under the Import Duties Act, 1932.

★ It's a small world when two analytical chemists from homes 12,000 miles apart, who do not know each other find themselves sitting almost next to one another at a dinner and they then learn that within a few days they will be working together. This happened to Dr. C. G. Haynes and Mr. T. McWilliam.

They were introduced by Alembic who sat between them at the SAC congress dinner at St. Andrews' Town Hall last week. Dr. Haynes is at the Grangemouth plant of the ICI dyestuffs division and Mr. T. McWilliam, who has been with ICI of Australia and New Zealand, is joining the research section at Grangemouth.

★ News of Fison's developments in Asia this year is given in a booklet published this week on past achievements, present performance and future plans. With Harrisons and Crosfield Ltd., Fisons Pest Control formed Fisons (Ceylon) Ltd. to manufacture, develop and market a range of crop protection chemicals in Ceylon. Tata-Fison Private Ltd. was formed this year to manufacture and distribute agricultural chemicals in India, utilising the chemical resources of Tata Chemicals.

The group's exports have doubled in value in the last three years and continue to expand rapidly. Apart from subsidiaries in South Africa and Australia, Fisons Chemicals (Export) Ltd., who handle all group products except fertilisers, has 180 agents in 86 countries.

★ A great deal has been said about the possible dangers to the consumer as a result of advances in food technology. The greatest single factor in safeguarding the public health is to increase the body of knowledge about the chemical composition of foods and their effects on the living body.

That was the view expressed by Professor A. C. Frazer, president of the British Food Manufacturing Industries' Research Association at the annual meeting last week. He thought it important that the food technologist should be able to make the fullest use of advances in cognate sciences. At present he cannot always do so. He should also be able to direct his researches towards an enhancement of beneficial effects and reduction of those that are undesirable. The main limiting factor is the lack of the necessary knowledge.

Some vital points about which not enough was known include the importance of food in the aetiology of many diseases and metabolic disorders and, perhaps, even cancer. Work in these fields is bound to wait, in most cases, on a more adequate definition of food composition in chemical and physical terms.

★ Pyrethrum, which has come to the fore in recent years has earned the tag 'the rich man's insecticide'. Its popularity seems to have been brought about by the fact that technical advances have reduced its price and because of reports that some species of insects are showing signs of resistance to certain synthetic insecticides.

More recently, the discovery in the US that the addition of comparatively inexpensive and non-insecticidal chemicals to pyrethrum extract could boost the activity of the latter has helped bring the cost of the material within the range of that of synthetic products.

Alembic learned from Mr. D. H. Pell-Smith, chairman of the Kenya Pyrethrum Board in London on Monday that it is unlikely that pyrethrum will ever be cheaper than its synthetic rivals.

★ Alembic wonders how many of the heavy smokers among his readers are cutting down or giving up their 40-plus a day ration following the report of the Medical Research Council. Doubtless they are following with interest the work of a group of French scientists who are said to have developed a method of making what have been called 'anti-cancer' cigarettes.

The method involves treatment of both the tobacco and cigarette paper with a number of chemicals. Ammonium sulphamate is being used to reduce the tar in cigarette paper, while the tobacco is being treated with certain nitrogen compounds. Two research laboratories, one run by Dr. Raymond Labarjet, the cancer expert, and the other by the state-owned tobacco interests, are collaborating.

The team of scientists are said to have isolated in the tar of cigarette paper and tobacco, 3:4–benzpyrene. They are stated to have established that the paper is very much more apt to lead to cancer than is the tobacco.

★ A mass of material from varying sources throughout the world is sifted each week in Chemical Age offices before an issue closes for press. A certain amount is consumed fairly swiftly by an apparently bottomless w.p.b. and a further, but smaller, amount is destined for the same fate after careful checking has revealed that its claims on our valuable space are somewhat dubious.

One item saved from a similar fate and passed to Alembic surely deserves to be framed. It comes from a quasi-scientific journalist who has the grace to admit he is not a chemist. He tells us he has recently 'more or less accidentally' come upon the fact that Sir William H. Perkin, who died 50 years ago, began the manufacture of the first dye—mauve—at the end of 1857!

This budding author, who shall be nameless, has been told that this pioneer of science was honoured 12 months ago, somewhat extensively, by chemists all over the world. The memory of Perkin, was, in fact, honoured not only in scientific publications but in the general and magazine press of the world.

★ Decision of the Birmingham Chamber of Commerce, who organise the British Industries Fair, not to hold the BIF in 1958 will puzzle many, although there should be wide agreement with the view that the Fair should in future be international in character. It was decided to hold no Fair in 1958 because it would be impracticable to organise it on an international basis in the time available. But there can be little doubt that the BIF is so well established that it could have been held next year on the same lines as this year's Fair with little trouble.

In any event, the decision to make the BIF an international fair is a wise one, particularly in view of the projected European free trade area. It might be considered prudent to bring the date forward a month or two to coincide with the more important international fairs held on the Continent.

Their experience of the 1956 Fair has justifiably made chemical manufacturers wary of the BIF. On that occasion a first-class chemical section was arranged in London, but proved a flop because of an announcement just before opening day that in future the BIF would no longer be held in London as well as in Birmingham. But a chemical section within a strong international fair at Castle Bromwich is another matter. In that event, the chemical industry should consider as soon as possible the desirability of staging a major exhibition either at Castle Bromwich or at a separate site to run concurrently with the Fair.

★ Mr. Russell Cook who was in charge of the Pfizer exhibit at the recent Poznan Trade Fair, the only exhibit of a UK pharmaceutical firm, was taken aback when a hirsute visitor demanded a free shave. After three similar requests, Mr. Cook investigated the mystery of why Polish visitors should expect free tonsorial treatment from a pharmaceutical concern.

He found that visitors associated the name of Pfizer with the Polish word for 'barber', which is 'frizjer'. Hence their assumption that Pfizer's, or frizjer's, was just the place for a clean shave!

Alembic

SUPPLY OF CAPITAL FOR SCIENTIFIC DEVELOPMENT

Carter and Williams Report Discussed

SOME of the implications of the report 'Industry and Technical Progress' by Professors Carter and Williams, reviewed in CHEMICAL AGE on 8 June (p. 967), were discussed at a conference convened by the Royal Society of Arts on 27 June. Subject of the meeting was 'Capital for scientific development; the problems of its supply for industry'.

A further meeting was held at Leeds University on 5 July, organised by the British Association, when the subject was 'The supply of scientists and technologists for industry'.

Opening the conference, Sir David Eccles, President of the Board of Trade, said there were three sources of new capital: the Budget, retained profits, and private savings.

'When the public sector has had its share is there enough left for the private sector? And can the private sector get its share efficiently? Does the right borrower come out with the loan? The answers in the book on the last point are better than I had expected. So also are the comparisons with rates of investments overseas.'

Financial Factors

Discussing the report, Professor C. F. Carter, one of the authors, said that some who had read it thought that it rather underestimated the importance of financial factors. 'I should like', he said, 'to persuade you that this is not so. We say in effect, that in the period of our study there were many firms which, whatever the reason for their unprogressiveness, certainly were not held back by lack of finance; they might be described as stagnant pools, motionless but liquid.

'But we found also that there were firms which had a brake set on their development by the difficulty of retaining enough money in a period of high taxation, or by their inability or unwillingness to raise money from outside; and that these firms included some which, from a technical point of view, were highly progressive.'

Professor Carter said:

'Of all the influences which affect technical progress, finance is the most easily regulated. We can do practically nothing to increase the supply of first class brains, and we can only slowly add to the number and quality of highly trained technicians and managers; but the Chancellor can vary the incidence of his financial or budgeting controls with very little delay.'

'The case of the large firm' was put by Lt.-Col. Lord Dudley Gordon, chairman, J. and E. Hall Ltd. and Hadfields Ltd., who defined a large firm as one that had a fully established research department. Such a department could only be fully effective when it was controlled by a full time executive director who was on the board of the company and who took his full part in framing the policy of the company.

'It is the absence of such a director on the board which is apt to lead to a feeling of frustration among members of research department which may arise at times through a feeling that its achievements are under-valued or not understood.'

Referring to a suggestion in chapter 13 in the book, that a board of directors might refrain from increasing a dividend in order that it might have funds to erect a new factory, Lord Gordon said that the amount distributed in dividends was such a small fraction of total outgoings that a variation in the percentage paid involved a negligible amount of cash.

'What is more likely to make directors hesitate to recommend an increased dividend is the incidence of distributed profit tax which was increased twice in six months. The money to meet this charge as well as the money to finance its operations has to be found by the company from profits which have already suffered income tax.'

In the discussion which followed Lord Gordon's talk, Mr. W. E. Duckworth, Glacier Metal Co., said that firms would appreciate some guidance as to what proportion of reserves to devote to research, together with some indication as to within what periods of time financial returns could be expected.

Not Enough Capital

Mr. L. J. George, Ferranti Ltd., said that the net amount of capital employed on research was not sufficient in this country. Had we anything to overcome this difficulty? He mentioned the National Research Development Corporation, which, he said, must show a profit. Its accounts must balance year by year.

There was a need for some central organisation to provide funds for research.

Speaking for NRDC, Mr. M. Zvegintov said that it was not possible to make a profit on a project in less than 10 years; 15 to 20 years would be nearer the mark. It might, he said, be necessary to spend £250,000 to find out the feasibility of a project.

Where the capital has to come from was discussed by Mr. F. S. Bedford, Barclays Bank Ltd. This country, he said, was capital starved. Previously money came from private backers who were willing to 'Have a go'. These conditions no longer applied. Although wealth was greater than ever before, there was a capital shortage. What had happened was a breakdown of the financial system which must be solved.

Summing up the morning's proceedings, Mr. E. H. Davison, Courtaulds Ltd., drew attention to the need for overcoming complacency which was encouraged by present-day accounting methods. Companies were not expanding but inflating.

The afternoon session was opened by Sir Nutcombe Hume, chairman, the Charterhouse Group, who put the case for the smaller firm. He was flattered to find that the conclusions drawn by Professors Carter and Williams accorded with his own company's, which derived from over 20 years' practical experience in the field.

'I think' said Sir Nutcombe, 'that the reader may be led from the context to think that the authors are seeking to segregate capital for scientific development from that for ordinary development, and I think there is really no difference between the two. Intelligent development of any kind is scientific.'

Sir Nutcombe's most serious criticism of the book was that the authors did not make a strong enough distinction between capital in the form of borrowed money and that in the form of share capital. He would like to see more done to teach the industrialist that of the two alternatives of getting into debt or parting with a portion of his equity, the latter was much more desirable and safe.

Professor Carter, speaking later, said that it was difficult to decide whether finance was the limiting factor.

Summing up, Lord Piercy, chairman, Industrial and Commercial Finance Corporation Ltd., discussed some of the problems of smaller firms. Of some 10,000 applicants for help, 6,000 were eliminated immediately. Only about 800 finally got through.

He was interested in a suggestion made by an earlier speaker that NRDC should be financed with funds provided by the equity element.

Balfour to Build Tower Box Purifier at Worcester

A £135,000 tower box purifier is to be installed at the Worcester Gas Works for the West Midlands Gas Board by Henry Balfour and Co. Ltd., gas and chemical engineers, Leven, Fife.

The tower box design consists of a large welded steel container sub-divided into five towers. In each tower there are six trays holding oxide to remove sulphur impurities from the entering gas. This enters each tower through large connecting mains, passes through the oxide and is purified. The spent oxide is changed by a mechnical device which tips it from the trays and re-charges them with fresh oxide.

Initially the plant will have a total oxide capacity of 28,400 cu. ft., and the gas throughput will be 4 million cu. ft. a day. Eventually it is hoped to double this throughput by adding six further oxide-holding trays to the east tower.

Work is due to begin at the end of this year and is scheduled to be completed by the end of 1958.

DOLLAR CHEMICAL IMPORTS FREED FROM AUGUST

IMPORT controls on a large number of commodities used in industry, including a wide range of chemicals, are to be removed on 1 August 1957. This was announced in a written reply to a Parliamentary question by Sir David Eccles, president of the Board of Trade, on Tuesday. This will mainly affect imports from Canada, the US, and other countries in the dollar area.

The following list does not contain goods which can already be imported from any country under Open General Licence.

Group 1—(food, drink, animal feeding stuffs and seeds) including:

Agar-agar; albumin, blood, fish or lacto; glucose; starches and starch preparations, not containing added sweetening matter and not packed for retail sale.

Group 2—(mineral products and metals) including:

Abrasives, crude, ground or graded (including artificial); agate; alloys of metals, unwrought, excluding gold, silver, thorium and uranium; asphalts, mastics and powder, natural; barytes; basalt (cast); boron minerals, crude, and concentrates of boracite and rasorite (kernite); chalk, precipated; clay; diatomaceous earth; dolomite; felspar, including china stone; fullers' earth; graphite crucibles; greensand (glauconite); hectorite; kieserite.

Lithium minerals including amblygonite, lapidolite lithiophilite, montebrasite, petalite, spodumene, triphylite, zinnwaldite; metallic ores, concentrates and residues, other than of silver, thorium and uranium; metals, excluding alloys unwrought, including antimony, bismuth, calcium, chromium, copper, gallium, germanium, hafnium, indium, iridium, lead, magnesium, osmium, palladium, platinum, potassium, rare earth metals including scandium but excluding cerium, rhenium, rhodium, ruthenium, sodium, tin, vanadium, zinc, zirconium.

Metals in the form of powder excluding cerium, gold, silver, thorium, uranium; quartz, common and quartzite; rutile; sand, excluding monazite sand; silicon; silica; slag, foamed; sulphur wastes and residues, being wastes and residues of which uncombined sulphur constitutes not less than 70 per cent of the dry weight; talc, steatite and soapstone, whether ground or not; tellurium; vermiculite, wollastonite.

Group 3—(oils, waxes, gums, resins, perfumery materials, etc.) including:

Oleine (oleic acid); petroleum bitumen; soap stock; stearine (stearic acid); waxes, excluding paraffin, polyoxyethylene, polythene.

Group 4—(miscellaneous animal and vegetable products) including:

Gelatine (technical and edible), glue and size; pyrethrum flowers and extract; saponin.

Group 5—(chemicals, drugs, medicines, dyes, colours and fertilisers) including:

Abietic acid; acrylamide; acrylic acid; allyl alcohol; allyl chloride; allyl glycidyl ether; aluminium fluoride; 2-aminodiphenyl; N-(2-aminoethyl)ethanolamine; 2-amino-2-hydroxymethylpropane-1:3-diol; 2-amino-2-methylpropane-1-ol; ammonia (including anhydrous ammonia); ammonium lignosulphonate; n-amyl methyl ketone; antimony oxide; argols and other crude tartrates.

Barium chlorate; barium nitrate; borax; boric acid; bromocyclopentane; 3-bromopropyne; tert-butylamine; tert-butylbenzoic acid; tert-butylcatechol; o-sec butylphenol; butyl vinyl ether.

Calcium cyanamide; calcium cyclamate; calcium hydrogen orthophosphate (dicalcium phosphate); calcium hypochlorite (including bleaching powder); calcium lignosulphonate; calcium nitrate; carbon, activated or decolourising; carbon blacks; charcoal (other than activated or decolourising); chlorine; chlorosulphonic acid; N-coco-morpholine; crotonic acid; cuprous oxide; cyclohexane-1:2-dicarboxylic anhydride; cyclohexylacetone; cyclopentylacetic acid.

Diallyl diethylene glycol dicarbonate; diisobutyl ketone; dicumyl peroxide; 2-diethylaminoethylamine; diethylenetriamine; 2:6-dimethylheptan-4-ol; dimethyl sulphoxide; diisopropylamine; divinylbenzene; dyeing and tanning substances including dyeing substances, natural, and extracts therefrom, henna leaves, tanning substances, natural, and extracts therefrom, tanning substances, synthetic.

Alpha - beta Epoxyethylbenzene; ethyl acrylate; ethyl vinyl ether.

Ferric tristearate; fertilisers including ammonium chloride, ammonium nitrate, ammonium sulphate ammonium sulphate / nitrate including mixtures of ammonium sulphate and ammonium nitrate; basic slag, calcium superphosphate, mineral phosphates of lime (ground or unground); furfural; furfuryl alcohol.

Gases, compressed including acetylene, dissolved and oxygen; germanium dioxide; glycollic acid; glycerol (glycerin).

Hexachloro-1:2:3:6-tetrahydro-3:6-*endo*methylenephthalic acid; hydrochloric acid; *p*-hydroxyanisole; 1-hydroxymethyl-5:5-dimethyl-hydantoin.

Lignin.

Magnesium chloride; magnesium oxide (fused); magnesium sulphate; manganese dioxide; 5-methylheptan-3-one; 1-methylheptylamine; *N*-methylmorpholine; 2-methylpentaldehyde; methyl *iso*propyl ketone; *N*-methylpyrrolid-2-one; *o*-methylstyrene; 2-methyltetrahydrofuran; 4-methyl-*n*-valeric acid; morpholine.

Nopol; nopyl acetate.

Pigments and extenders, dry, including titanium dioxide; 1H:1H-pentadecafluoro-octan-1-ol; 4-phenylcatechol; *N*-phenylmorpholine; pitch, wood; plastics materials, including, cellulose acetate butyrate moulding powders, cellulose acetatephthalate, polyvinyl butyral film, polyvinyl formal, polyvinyl phthalate, vinyl butyral resins; poly*iso*butylene; potassium compounds including potassium carbonate, potassium chlorate, potassium ferricyanide, potassium hydroxide, potassium nitrate, natural, potassium sulphate; *iso*propyl-alpha-alpha-dimethylbenzyl hydroperoxide; pyromellitic dianhydride.

Selenium; sodium compounds including sodium *iso*ascorbate, sodium borohydride, sodium chlorate, *mono*sodium glutamate, sodium methoxide, sodium nitrate (natural), sodium pentachlorodihydroxytriphenylmethane-sulphonate; stearyldimethylamine; succinyl peroxide; sulphuric acid.

Tar, wood, terpinolene; tetrachlorophthalic anhydride; tetraethylene-pentamine; tetrahydrofuran; tetrahydrofurfuryl alcohol; *NNN' N'*-tetra-(2-hydroxypropyl)diaminoethane; tetraphenylbutadiene; monothioglycerol; toluhydroquinone; triisobutylaluminium; tri-2-(2-ethylhexyl) phosphite, trifluoroacetic anhydride.

Vinyl propionate; vinyltoluene.

Zirconium oxide, whether or not heat stabilised.

Phthalic Anhydride Exempted From Duty

AMONG chemicals exempted from Key Industry Duty for the period 28 June to 18th August is phthalic anhydride. Other exemptions are:

Ethylene brassylate (an ethylene glycol ester); 2-ethyl-2-hydroxymethylpropane-1:3-diol (a trimethylolpropane); ethyltrichlorosilane; R. laevulose; phenyl isothiocyanate; piperonylic acid; procaine hydrochloride (an aminobenzoic ester salt); and sodium peroxide.

The Treasury order governing these exemptions is the Safeguarding of Industries (Exemption) (No. 5) Order, SI 1054/1957, price 2d., or 4d. by post, from H.M. Stationery Office, Kingsway, London WC2, or branches.

Silicones Office

AFTER only six weeks of construction the new silicones department head office building of Imperial Chemical Industries Ltd. at Ardeer was completed and put into use.

The decision to create such headquarters arose from the view taken earlier, and reinforced by later experience, that the silicones department should form a special branch in view of the particular markets to which silicones are directed.

The single-storey building which was planned by the Ardeer engineering department was erected by ICI staff, only the electrical and hot water supplies being undertaken by outside contractors.

BISRA Annual Report

The *British Iron and Steel Research Association Annual Report* for 1956 contains a new section dealing with industrial applications of BISRA developments. As in previous years, the report comprises summaries of the investigations of the divisions and departments, together with the accounts and the usual appendices.

Permitted List of Dyestuffs in Food

'I THINK you all know something of our views on the use of colouring matters in food,' said Mr. Joseph Godber, MP, joint parliamentary secretary to the Ministry of Agriculture, at the British Food Manufacturing Industries' Research Association lunch on 27 June.

'Hitherto we have operated on the principle of a prohibited list', said Mr. Godber. 'Certain listed colours have been banned, but any others could be used without restriction. This has become unsatisfactory for we have had increasing evidence that some of these other colours do present a hazard to health. We are, therefore, making new regulations which are based on the principle of a permitted list.' The regulations list certain colours which alone may be used in food.

He added: 'I know that our activities invariably mean new restrictions for food manufacturers. We are now preparing regulations which will permit for the first time the limited use of antioxidants in foods.'

Obituary

Dr. F. T. Meehan, former chairman and managing director of Imperial Chemical Industries of Australia and New Zealand, died on Tuesday in Melbourne, aged 59. Dr. Meehan left the ICI parent in 1942 for Australia. He resigned as chairman and managing director four years ago because of ill health but continued as a director.

FOR YOUR DIARY

MONDAY 8-FRIDAY 12 JULY

SCI - Leeds University, Annual Meeting

MONDAY 8-TUESDAY 9 JULY

Chemical Society—London: Queen's Building, Queen Mary College. Symposium on 'Solvent effects and reaction mechanism'.

THURSDAY 11-FRIDAY 12 JULY

Chemical Society—Glasgow: Chemistry Department, University of Glasgow. Symposium on 'Recent advances in the chemistry of terpinoid compounds'.

Top table at the SAC congress dinner in St. Andrews Town Hall, l. to r. Dr. D. C. Garratt (Boots Pure Drug), Dr. R. L. M. Synge (Rowell Research Institute), Dr. E. B. Hughes (J. Lyons and Co.), Mrs. Hughes, Dr. G. M. Bennett (Government Chemist), Mrs. Pyke, Dr. Magnus Pyke (chairman, Scottish section), Dr. J. Craik (chairman, ICI Nobel division), Dr. A. I. M. Keulemans (Koninklijke/Shell Laboratorium), Dr. D. Traill (ICI Nobel division), Professor G. F. Smith (Illinois University) and Professor A. D. Walsh (Dundee).

Petrochemicals May Make Greater Use of Continuous Gas Chromatography

SAC CONGRESS

This summary of Dr. A. I. M. Keulemans' paper introduces the final part of our special report on the SAC congress at St. Andrews. The first section appeared in last week's Chemical Age

METHODS of gas chromatography had proved of great value not only in the research laboratory, but also in plant control laboratories concerned with the operation of processes on a large scale, stated Dr. A. I. M. Keulemans (Koninklijke/Shell-Laboratorium, Amsterdam, N. V. De Bataafsche Petroleum Maatschappij) in his paper on *'The Application of gas chromatography in the petroleum industry.'*

In his paper he dealt with the research aspect, in particular, the evaluation of crude dicyclopentadiene (DCPD) by gas chromatography, and he showed how it afforded a simple explanation of difficulties encountered in starting up a commercial plant for the manufacture of methyl isobutyl ketone.

Gas chromatography had solved intricate analytical problems concerned with contaminants in commercial DCPD. Dr. Keulemans, discussing particularly that part of the product boiling higher than the solvent (toluene), said that it had been assumed at first that the dimers and codimers present in crude DCPD originated from purely cyclic dienes. Chromatograms of laboratory-prepared dimers of pure cyclopentadiene (CPD) and of dimers of pure methyl CPD (both in toluene dilution) as well as of a product obtained on dimerisation of an equimolecular mixture of CPD and the CPD had been determined.

An adequate method of analysis of crude DCPD could comprise (a) the chromatogram of the crude DCPD (b) the chromatogram of the low-backing material (monomers) in the depolymerised DCPD and (c) the chromatogram of the 'high-boiling' material in the the chromatogram of the low-boiling depolymerised DCPD (for the chromatography under (b) CPD and the acyclic diene piperylene were not separated).

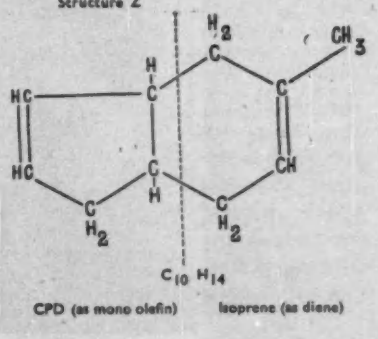
Success of analysis on Sample 1 resulted from the dimers and codimers in the crude DCPD produced, due to these being almost completely obtained from cyclic dienes, which was not the case with the second sample investigated.

From two figures obtained it could not be concluded whether the crude DCPD already contained the impurity, termed B (ie, from peak B) or whether this impurity had been formed on depolymerisation. Substance causing peak B in the chromatogram was first isolated, and from mass spectrometric analysis its molecular weight was estimated at 134, which was in agreement with the molecular weight of the codimer of CPD and an acyclic pentadiene. Apart from possible stereo isomers three different structures of such a codimer might be discovered.

Structures, termed X and Y, were formed if in an addition reaction of the Diels and Alder type, CPD reacted as the diene molecule and isoprene (or piperylene) as a mono-olefin. Structure Z was obtained if CPD entered into the reaction as the mono-olefin.

Compared with X and Y, Z was fairly stable and it was not depolymerised under standard conditions of pyrolysis. Z was thought to be the most likely for peak B and this was confirmed by infrared analysis.

Structure Z



CPD (as mono olefin) Isoprene (as diene)

To identify peak A in the chromatogram, the codimers were prepared by thermally reacting mixtures of isoprene and CPD in equimolecular quantities. This reaction was carried out successively at different temperatures. Chromatograms of the dimerisation products indicated that the amount of A increased with increasing polymerisation temperature. Isolated finally and subjected to depolymerisation A disappeared, which could only partly be ascribed to depolymerisation. Dr. Keulemans suggested that under depolymerisation X or Y must have been rearranged to form the relatively more stable Z. The DCPD peak obtained probably corresponded to pure DCPD and B was formed in the pyrolysis step. Part of the CPD present in crude DCPD could not be completely recovered as CPD.

This analysis was conveniently carried out in a combination of reactor and equipment for gas chromatography as described by Kokes, Tobin and Emmett.

Referring to the application of gas chromatography in the plant laboratory, Dr. Keulemans reported that during the start-up of a distillation plant for crude methyl isobutyl ketone (MIBK), it was observed that the initial boiling point of the finished product was a few degrees low, while the IBP of the first column-bottom was on specification. The second column product was, therefore, first analysed by gas-liquid chromatography and it was determined that the low-boiling contaminant in the top product was acetone. No acetone could be detected in the botton product of the first distillation column. However, the presence of diacitone alcohol (DAA) was shown. Decomposition of DAA, it was suggested, might occur during distillation in the bottom of the second distillation column. The prob-

lem was solved by gas-liquid chromatography in two hours.

A continuous analyser appeared to be a logical extension of the application of gas chromatography in the plant laboratory, and was being investigated by instrument manufacturers. Several US companies, according to Dr. Keulemans, are nearly ready to move prototype continuous analysers into refineries, and petrochemical plants.

A main difficulty in the development of these analysers was the construction of the sampling device. A still unsolved problem was the entirely automatic introduction of liquid samples over long periods without attention, usually in undesirable environments when compared with the laboratory. Microlitre samples only could be taken and the quantity had to be kept constant to within one or two per cent. No contamination of one sample by another could be tolerated. The problem was less involved with gaseous products. Volumes 1,000 times as large could be taken and the risk of contamination was also much less. Gas analysis seemed to be of most importance.

Continuous gas analysers described by Bradford *et al.* (*J. Inst. Petrol*, 1955, **41**, 80) and *Oil and Gas J.* (1956, (July), 66) were mentioned. A description of a continuous gas analyser, developed by J. Hoojmeyer *et al.*, in Koninkiljke/Shell-Laboratorium, Amsterdam) was to be published shortly, stated Dr. Keulemans.

A Main Feature

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Such a possibility was offered by the use of tracer techniques. The addition of a carefully selected tracer could give a specific and a sensitive method of following an industrial process, although the use of stable isotopes might not be commercially practicable except on very small scale plants, as even in the most favourable cases the maximum dilution factor was not more than about 1,000. Where production was of necessity small as in the refinement of platinum, then labelling with an inactive isotope could be used.

Cost of equipment for some analytical techniques was considered. This consisted of a lead castle to hold the sample, a Geiger-Muller tube for detection, a probe-unit, an EHT supply for the tube and sealers and a scaler for counting the detected pulses. Such equipment was available for £170. On dangers associated with radioactivity, the authors remarked that the techniques were no more dangerous than many other analytical procedures.

In the laboratory tracer techniques could be used to explore new analytical techniques and to decrease the expenditure of time and high grade effort in the application of established techniques. A particular substance could be followed through ion exchange, solvent extraction, paper chromatographic separation, precipitation etc. Losses occurring during a separation could be detected merely by counting precipitate and filtrate or the two liquid phases, or eluent and column of the stage suspected. Separation of arsenic from germanium was investigated using arsenic-76 as a tracer and separation of rare earths.

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Radiometric technique was then considered. Thallium had been determined in this way by precipitation with hexamine cobaltic chloride labelled with active Co^{60} and then measuring the acivity present in the precipitate.

Inactive samples could be determined as a consequence of the interaction between them and radiation in the form of rays or particles. Such interactions could be divided into:

(1) Absorption leading only to attenuation of the incident radiation; the extent of attenuation could be measured.

(2) Absorption leading to the production of new radioactive species which could be studied.

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Basis of Technique

Absorption and attenuation of atomic radiation in passing through matter made the basis of an analytical technique, it was stated. Thus β-particle absorption might be used to determine the hydrogen content of liquid fuels. The principle used here was that hydrogen absorbed more β-particles than equal weights of other elements. So as the hydrogen content of a sample of oil varied so would its absorbing power for β-particles. Strontium −90 was used as a source of β-particles and two beams from this were compared, one having passed through a standard absorber, the other through the hydrocarbon sample.

A similar technique using the absorption of X-rays from Fe^{55} had been used to determine the sulphur content of hydrocarbons. Other absorption methods suggested were the neutron absorption graphs for many elements as various as light absorption curves. Use of absorption of γ-radiation for analytical determinations had been explored at the Windscale Works of the Authority and continuation of the work at Harwell had shown that uranium concentrations in the ranges 10-200 mg/ml U might be determined by the absorption of the γ-ray emitted (say) by thulium-170.

A second effect of bombardment of matter with radiation was the production of new radioactive species. Measurement of these was the basis of radio-activation analysis. This technique, said Smales and Ferrett, could be one of the most highly sensitive and specific techniques available to the analyst today. Neutron activation analysis gave particularly good results as high fluxes were available in reactors.

As a number of parameters, such as half-life, neutron cross-section and property of emitting radiation, was available, by using a combination of these it was sometimes possible to determine one element in trace amounts in the presence of large quantities of another element. The analytical procedure consisted of irradiating the sample and a standard, containing a known quantity of the element being determined, and comparing the activities produced, after the addition of milligram amounts of an inactive carrier.

Sensitivity of the method depended essentially on the values for activation cross section of isotope absorbing neutrons and neutron flux/cm^2/sec. Arsenic at 10^{-10}g had been measured in distilled water.

A further advantage when working at such low impurity levels was the freedom from external contamination, that might be caused by addition of reagents containing significant amounts of the element to be determined. Addition of impurities after irradiation could be ignored, as only the radioactive arsenic was measured. Results obtained for copper, antimony and arsenic in pure silicon illustrated the extreme sensitivity attainable by neutron activation.

On the bombardment of matter with X-rays, Smales and Ferrett said that improvement in recent years in the production of stable sources of X-ray beams and in methods for the measurement of the X-rays produced, had made this principle a basis for quantitative analytical techniques. The method was most suitable for the determination of elements of high atomic weight and here it could prove more useful than emission spectrography for the spectrum was far simpler.

Other Properties

Other properties which could be used as bases for analytical methods were the *spin* and the *mass*. The spin of the nucleus was used in nuclear magnetic resonance techniques. With field strengths of 5-10 kilo Gauss and homogeneities of one part in 10^7-10^8 highly complex spectra could be obtained which gave information about molecular configuration and chemical binding. With magnets of lower homogeneity (one part in 10^2-10^4) simpler spectra were obtained and could be used as a method of isotopic analysis.

Quantitative signals could be obtained from some 100 isotopes, the authors stated. The method was most sensitive for hydrogen and fluorine (down to 0.03 per cent) but boron—11 and lithium-17 had been determined down to 100 μg/ml. The method was non-destructive and rapid (20 minutes). It should prove of value in moisture determination for example.

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(1) Although a Van de Graaf accelerator was much cheaper than a reactor (£50,000 to £60,000 for the accelerator as against some £3 million for a reactor) the maximum neutron flux was of the order of 10^{6}n cm^{-2} sec^{-1} and was therefore about 10^{4} times smaller than that available in BEPO.
(2) It was difficult to run the accelerator at much more than half power which added another factor of time.
(3) It was impossible to run the accelerator for much more than half an hour, whereas an irradiation in a reactor might be carried out for as long as necessary. If it was assumed that an irradiation in a reactor was carried out for one week a further factor of about 400 was introduced making a total of 8 by 10^{8}, i.e. approximately 1 by 10^{9}.
(4) Taking the most favourable cases where the sensitivity was of the order of 10^{-12}g. it was found that for the reduction factor the limit of detection was of the order of 10^{-6}g., that is, that one was back to the wet chemical methods.

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Dr. Ferrett thought that that was very true. The Van de Graaf gave fluxes of 10^{-7}. It had been used for halides using deutrons as accelerators. If there was no pile, a Van de Graaf could be used. This applied to the cyclotron, although fluxes were larger. In discussing irradiation, he had brought in the Van de Graaf accelerator as he had not wished to give the impression that one could only carry this out at Harwell.

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Dr. Ferrett in reply said Nature had

lem was solved by gas-liquid chromatography in two hours.

A continuous analyser appeared to be a logical extension of the application of gas chromatography in the plant laboratory, and was being investigated by instrument manufacturers. Several US companies, according to Dr. Keulemans, are nearly ready to move prototype continuous analysers into refineries, and petrochemical plants.

A main difficulty in the development of these analysers was the construction of the sampling device. A still unsolved problem was the entirely automatic introduction of liquid samples over long periods without attention, usually in undesirable environments when compared with the laboratory. Microlitre samples only could be taken and the quantity had to be kept constant to within one or two per cent. No contamination of one sample by another could be tolerated. The problem was less involved with gaseous products. Volumes 1,000 times as large could be taken and the risk of contamination was also much less. Gas analysis seemed to be of most importance.

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specified its own specification since the gamma energy and half-life could be measured.

Dr. J. Haslam (ICI plastics division) wanted to know if, when a substance was activated and a known substance was added, did the ratio remain the same, or was it assumed?

It was assumed, said Dr. Ferrett, that the ratio was proportional to the square root of the mass. No discrepancies had been noted.

Dr. A. R. Sommerville (ICI Akers Research Laboratories) wanted to know about irradiation of material at Harwell at a customer's request. Was the purest grade of material used?

Dr. Ferrett said that the purest grade was used. If the customer wished, however, he could provide his own.

Dr. Barker Describes Trends in Polarograph Design

IN THEIR paper on *Some Present and Future Trends in polarograph design*, Dr. G. C. Barker, Mr. G. W. C. Milner (UKAEA, Atomic Energy Research Establishment, Harwell) and Mr. H. I. Shalgosky (UKAEA Research Group, Woolwich Outstation, Royal Arsenal, Woolwich) said that the square-wave polarograph was very useful for the determination of trace metals in the presence of major amounts of constituents, reducing at the dropping mercury electrode at more positive potentials, as for example, in the analysis of steels and copper base alloys.

Limit of Sensitivity

The sensitivity of any highly developed AC polarograph such as the square wave polarograph (SWP) was limited not by the noise level of the electronic circuits, but by the instability of a capillary response associated with a tendency for solution to enter the capillary of the dropping mercury electrode. To some extent the fluctuations in the baseline of the polarogram caused by variations in this capillary response could be reduced by using a voltage sweep synchronised with the growth of the mercury drop and a high speed recorder or cathode ray tube presentation. With this slight change in technique, the SWP could be used to detect changes of concentration as small as 10^{-4} M in the case of a doubly-charged ion which was reversibly reduced though it might still be difficult to determine the actual concentration of an ion if the wave was situated on a curved part of the baseline. The synchronised sweep technique might be incorporated in future models of the SWP as it greatly reduced the time required for a determination without reducing the sensitivity of the instrument or impairing its ability to discriminate against interfering ions.

Capillary response could be completely eliminated, said Dr. Barker, by using a RF polarising current in place of the square wave voltage generally used in square wave polarography. This resulted in some increase in sensitivity for reversibly reduced ions and in a considerable increase in sensitivity for ions which were irreversibly reduced at potentials appreciably more negative than the potential of the electro-capillary maximum. This new technique might also be incorporated in future models of the SWP.

Yet another method for reducing the capillary response involved the use of a polarising pulse with a duration of 1/25 sec. which was applied to the cell at a definite time in the life of each drop. The pulse polarograph made use of this method and gave both a derivative and a normal polarogram, the latter type of polarogram being automatically compensated for any diffusion current at the start of the polarogram. With this new instrument reversibly reduced and irreversibly reduced ions could be detected at concentrations below 10^{-5}M and 5×10^{-6}M respectively in favourable circumstances.

It was possible also to increase the sensitivity of the conventional DC polarograph by means of simple circuits which provided automatic compensation for any change in residual current and which recorded the value of the diffusion current at a predetermined time in the drop life instead of the average diffusion current.

Discussion

Mr. G. E. Penketh (ICI Billingham division) asked whether the square wave polarograph had been used for organic reductions and what was its sensitivity?

Dr. Barker said that the sensitivity of the square wave polarograph would be about 20 times smaller than corresponding instruments.

Mr. G. Spencer (Clayton Aniline Co. Ltd.), commented that the question of polarography versus the much cheaper solvent colorimetric method for the determination of trace metals in foodstuffs, foodstuff additive chemicals, etc., was a matter of considerable interest. To determine a fraction of a precipitate of lead in 0.5 g. of cocoa (as illustrated by the authors of the paper) was very beautiful but normally the problem was not so simple as that. Usually one had to determine arsenic, lead, copper and possibly zinc, on a routine basis using trained laboratory assistants rather than the trained chemist. The big disadvantage of the solvent colorimetric methods was the large amount of chemical processing where mistakes could occur. He gathered that arsenic in traces was the difficulty in the polarograph. The authors took this as comment and made no answer.

Discussion on Paper by Mr. A. R. Powell

(See last week's issue)

Dr. A. T. James (Medical Research Council) enquired whether any attempt had been made to form the volatile derivatives of rare earths and run them on gas chromatogram. Mr. Powell's answer was 'No'.

Mr. D. R. Curry (Services Electronics Research Laboratory) wanted information on determination of gas in vacuum purified metals such as pure niobium, tantalum, tungsten, platinum.

Mr. Powell said this had been done in iron. He had used this method with tantalum, with molten iron and zirconium in platinum. He suggested heating in a graphite crucible under vacuum. He had used this with ruthenium.

Mr. Curry then asked whether oxygen was present as oxide or as gas. Single crystals, he thought may contain undecomposed oxide.

With regard to his experience Mr. Powell said tantalum oxide was soluble in metal, therefore oxygen could be present. The vacuum technique already suggested would get this oxygen.

Mr. D. R. Fellows (Standard Telecommunication Laboratories Ltd.) referred to silver analyses in platinum ware. It was suspected that silver was being lost in solution stage into platinum crucible. Was this possible?

What solutions were being used, asked Mr. Powell.

Mr. Fellows said nitric acid and hydrofluoric acid. Then, said Mr. Powell, he thought chloride was involved somewhere.

Mr. Fellows asked whether Mr. Powell thought the silver was dissolving on to the surface of the platinum.

Mr. Powell thought this was highly unlikely.

At St. Salvators' Chapel (l. to r.) W. J. Parker (Mervyn Instruments), W. E. Field (Crookes Laboratories), Dr. J. C. Milner (A E R E Harwell), Mrs. Parker and Dr. R. C. Fawcett (General Chemical Pharmaceutical Co Ltd.).

AN APPROACH TO AUTOMATIC ANALYTICAL MEASUREMENT

D. A. Patient Describes New Instruments

LACK OF adequate staff and/or trained staff were factors that had led to the development of automatic instruments in analytical procedures, suggested Mr. D. A. Patient (Baird and Tatlock (London) Ltd.), in his paper on '*An approach to automatic analytical measurement*,' presented on Thursday afternoon. There were instruments which could be regarded as semi-automatic and while needing an operator to prepare samples etc., performed the actual measurements automatically. A typical example was the Karl Fischer apparatus.

Mr. Patient then described a new category of instruments introduced to cater for techniques requiring the handling of a large number of discrete samples, which were often available only in small sample volumes. A feature of such equipment was that it comprised separate units, each to perform one function, so that it was feasible to adapt a certain set of units to carry out alternative procedures if desired.

He then showed for the first time examples of apparatus designed specifically for the requirements of one company—an automatic dispensing pipette (see p. 27 for further details). By means of this apparatus 30 tubes can be given a predetermined volume of reagent. By employing several of these units in series, a sample could be dosed with a number of reagents in turn and, if necessary, the movement of the rack through the units could be achieved by a mechanical drive.

New Transfer Pipette

Another new piece of apparatus, a transfer pipette, was also illustrated. This was designed to withdraw a fraction from the lower phase in the tubes after a liquid-liquid extraction had taken place (see p. 27 for further details).

Operations performed by these pieces of apparatus afforded considerable saving in time and achieved a standard of repeatability which could not otherwise be achieved or maintained except with extreme care.

In a third category were the fully automatic laboratories, which once set up could be left to carry out a particular series of operations and to record measurements with only a minimum of periodic maintenance. Mr. Patient then discussed automatic instruments for *p*H measurement, colour density by absorption, analysis of samples and titration as included in Baird and Tatlock's range of automatic laboratories. These laboratories were illustrated by slides and a short film.

In discussing the automatic titrator, it was stated that this instrument had been designed to give the user the actual answer on the record. An adjustment had been provided which made it unnecessary for an operator, when making up fresh reagent stocks, always to reproduce the exact normality previously used yet at the same time the calibration of the apparatus could be maintained.

Mr. J. Brooks (Nobel division) ICI Ltd.), asked about the cost of the various types of Analmatic equipment.

Mr. Patient replied that costs varied greatly, ranging from the Analmatic Karl Fischer apparatus at £200 to a uranium analyser, the Mark III Analmatic Laboratory at £4,000. The dispensing unit described during the lecture would cost about £70 and an automatic titrator about £200. He pointed out that capital expended on such apparatus was soon regained. One company had reported savings of over £30 a week.

Mr. J. E. Lloyd (Esso Research Ltd.) wanted to know whether Mr. Patient's company tended to rely on clients for ideas or did the ideas for new apparatus and equipment come from within the company.

Answering this Mr. Patient said ideas came from both clients and within the company. The Analmatic laboratories had developed following a request from Harwell.

Mr. Lloyd then asked if there was any hope of a fraction cutter to seal tubes after they had been filled.

Dr. A. T. James (Medical Research Council) stated that this equipment was already available.

Dr. A. E. Martin (Grubb Parsons and Co. Ltd.) wanted to know why separate sampling only was carried out in the automatic titrator, and not continuous sampling.

If pH only was wanted, then one could carry out continuous sampling on a pH meter, said Mr. Patient.

Dr. James wished to know whether Baird and Tatlock had ever considered replacing the burette in Analmatic equipment by small pumps. He knew that some company was looking forward to bringing out something other than a linear burette.

Mr. E. F. Kemp (UK AEA) remarked that while he was fully in agreement with automatic apparatus, he considered the human touch of the chemist was valuable in noting, for instance, only slight changes in the solution, etc.

Mr. Patient agreed with this. He pointed out, however, that it was possible to build into units special alarm systems which would suit any likely trends that might occur during a given reaction.

Mr. G. Spencer (Clayton Aniline Co. Ltd.) thought the point regarding clumsiness of a titration made by Dr. Martin was a good one. He felt a burette measurement was important.

Dr. J. Haslam (ICI plastics division) enquired whether it was going to be an easy matter to get an instrument which would plot a full potentiometric curve?

Mr. Patient said one would have to plot against a known curve. The automatic titrimeter was not a research tool.

Dr. S. F. Bohlken (Mekog, Ijmuiden), wanted to know whether it was possible to use a not quite clear solution in an Analmatic laboratory. Could the valves be cleaned out if sludge was present.

Valves would, of course, not act for very long if sludge, etc., was present, said Mr. Patient. However, various types of filtering could be done using ceramic or stainless steel filters, etc. One had to find out how soon filters needed to be cleaned. In such cases, a dual set of valves could be built into the unit.

Mr. T. McWilliam (ICI ANZ Ltd.) asked what provision there was should these electronic instruments go wrong and give incorrect results.

Errors could not occur in that way replied Mr. Patient. Provision was made in the automatic laboratories, etc., to check incorrect results by timing. All operations were referred to a pre-timer. Thus, when the equipment was in use, it was pre-set to a known time for operation. After this set period, the instrument shut itself down.

Mr. W. E. Bibby (British Industrial Solvents) remarked that he had now solved his problem which was similar to Dr. Haslam's.

Mr. G. E. Penketh (ICI Billingham division) referring to Bibby's statement said that US company, Dow, had developed the Dow automatic titrimeter recorder, which did not give a fixed pH value, but which drew a full pH curve (with molar solution added) from which end point can be found.

Mr. G. Mattock (Electronic Instruments Ltd.) stated that automatically recorded curves could be obtained with apparatus devised by Simon and Heilbronner (reported in *Helv. Chim. Acta* and now available through his company). With regard to the elimination of burette readings, a

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colleague, Dr. Jackson, had successfully determined substances by utilising the flat portion of a weak acid—strong base curve. If a constant volume of weak acid was added to say, an ammonia sample, then the pH obtained was directly related to the ammonia concentration. A similar principle had been used by them to determine nitrate ions by reduction with ferrous ions.

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The hydrolysis products, in their turn were examined. Methods of analysis worked out were those of mixed base hydrochlorides on one hand and mixed acids on the other, supplemented by infra-red spectra of nylon-type polymers. Identification work was then carried out by simple comparison of the spectrum of a sample under test with the spectra of known nylon-type polymers.

Where new polymers could not be identified in this way, chemical breakdown with acid and identification of hydrolysis products was required. Thus, useful methods of identification of newer polymers such as the interpolymer of polycaproamide (nylon 6) polyhexamethylene diamine-adipamide (nylon 66) and poly-p-diaminodi-cyclo-hexyl methaneadipamide (nylon PAC M6) were sought.

The paper chromatography method of identification of nylon and related polymers had thus been developed. Essentially this involved hydrolysis of 25 mg. of the polyamide with 50 per cent v/v hydrochloric acid and observations of the behaviour of the polyamide in this hydrolysis. The hydrolysis product is evaporated and excess hydrochloric acid removed by further evaporation with water. The residue is dissolved in alcohol and observations made on the solution.

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P.v.c. and its compositions often contain lead additives and lead determination may be required to decide correct formulation of a given preparation. A rapid test involves dissolving lead filled compositions in ethylene dichloride. Lead is extracted with strong hydrochloric acid solution. The solution is separated and diluted to 50 per cent v/v strength with water prior to lead measurement by UV absorption of lead chloride at 270 mμ

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To determine the strength of formaldehyde, neutralised formaldehyde is treated with neutral sodium sulphite to produce the bisulphite formaldehyde compound and an equivalent of sodium hydroxide which is titrated to pH8·95 with standard acid. Nylon 6:10 salt in moist material is determined by dissolving salt in excess acid, and excess back titrated with standard alkali to pH3·65. For the determination of aldehydes and ketones (calculated as acetone) in methyl methacrylate monomer, a known volume of monomer is shaken thoroughly with hydroxylamine hydrochloride of known pH value. The mixture is then titrated with standard alkali back to pH of original hydroxylamime hydrochloride. Correction should be made for any methacrylic acid.

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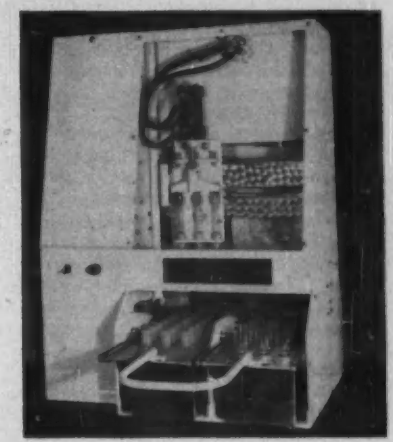

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Samples are placed, 30 at a time, in racks of 10 rows of three tubes each. The apparatus contains three modified syringe type pipettes side by side to supply the three tubes in each row in turn. Each pipette has two electromagnetically operated valves for filling and draining.

As the rack moves into the apparatus the pipettes are filled. When the first row of three tubes is under the pipettes, these empty a predetermined volume of liquid into the tubes. This process is repeated for each of the 10 rows of tubes. By using several of these units in series, a sample can be dosed with a number of reagents in turn. If necessary the movement of the rack through the apparatus can be carried out mechanically.

A similar principle of operation applies to the transfer pipettes, which are designed to withdraw fractions from the lower level in tubes after a liquid-liquid extraction has taken place. These fractions are then transferred to another set of tubes.

Two parallel sets of tubes are required, one for the liquids from which the samples are being taken and one to receive the transferred samples. The three pipettes are lowered into the first set of tubes, filled, raised, moved to the right until they are above the empty tubes, lowered, emptied, raised and returned to their original position.

Operations of the type described above are said to give a considerable saving in time and at the same time to achieve a high degree of repeatability.

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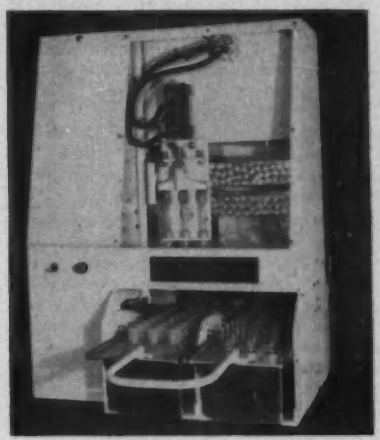


Automatic transfer pipette

Samples are placed, 30 at a time, in racks of 10 rows of three tubes each. The apparatus contains three modified syringe type pipettes side by side to supply the three tubes in each row in turn. Each pipette has two electromagnetically operated valves for filling and draining.

As the rack moves into the apparatus the pipettes are filled. When the first row of three tubes is under the pipettes, these empty a predetermined volume of liquid into the tubes. This process is repeated for each of the 10 rows of tubes. By using several of these units in series, a sample can be dosed with a number of reagents in turn. If necessary the movement of the rack through the apparatus can be carried out mechanically.

A similar principle of operation applies to the transfer pipettes, which are designed to withdraw fractions from the lower level in tubes after a liquid-liquid extraction has taken place. These fractions are then transferred to another set of tubes.

Two parallel sets of tubes are required, one for the liquids from which the samples are being taken and one to receive the transferred samples. The three pipettes are lowered into the first set of tubes, filled, raised, moved to the right until they are above the empty tubes, lowered, emptied, raised and returned to their original position.

Operations of the type described above are said to give a considerable saving in time and at the same time to achieve a high degree of repeatability.

New Analytical Reagents in Plant Control Operations

By Professor G. F. Smith of Illinois

UNUSUAL applications and accompanying instrumentation as applied to analytical operations had served a major role in glamorising the field of analysis. It was also apparent that the outstanding contributions of instrumentation in analysis had overshadowed the none the less important study of chemical processes and reaction kinetics upon which instrumentation was fundamentally dependent. This was stated by Professor G. Frederick Smith (Illinois University) in his congress lecture entitled '*New analytical reagents and their applications in industrial plant control operations*' on Thursday, 27 June.

One of the most important advances in analytical research and development was in the applications of organic analytical reagents. A leading example was the development of the Schwartzenbach reagents known as the complexones. Perhaps the second most important application to analysis was the advent of a wide variety of artificial organic zeolite resins.

Number of Determinations

Professor Smith said he had attempted to estimate the number of routine industrial uses of the complexones and exchange resins made annually in the US. One authority estimated that the number of routine analytical determinations involved rivalled in numbers those of the Babcock butter-fat test employed in dairy control laboratories, which were estimated at 40 to 50 million annually.

Well-known organic reagents pinpointed by Professor Smith as being of considerable value included the dioximes, modified quinolinols, the fluorenones, diphenyl amines and the methine chromophore group of organic reagents (the polycyclic dipyridines and quinolines), the tri-pyridines and 1,10-phenanthrolines. Uses of some of these reagents as oxidation-reduction reagents indicators and for trace element determination as well as chemical sequestrants were of outstanding value. It was a justifiable estimate that trace element determinations for iron and copper (using the methine chromophore group organic reagents) in the US annually totalled about 10 million routine control analyses.

The field of inorganic analytical reagents as applied to research and routine operations was well represented by a series of periodic acid chemicals, particularly potassium periodate in colorimetric determinations of manganese in steel and agricultural routine control. Potassium periodate reagent was known some 15 years before it was made commercially available. With its ready availability the colorimetric determination of manganese soon became the official method of standardisation for the America Water Waterwork Association, the AOAC and the ASTM.

A valuable analytical control procedure using periodates was applied to determination of glycerol in soaps and explosives. Lead tetra-acetate and Ce(IV) reagents were companions with periodic acid derivatives in similar routine control analyses for many industries. Periodate chemicals were also being used in processing proprietary chemicals, particularly pharmaceuticals.

In the last 25 years there has been a rapid growth in the applications of cerium to analysis. At first available as ceric oxide as a suitable reagent for the preparation of Ce(IV) volumetric solutions, adoption of Ce(IV) for volumetric analytical routines had been delayed by the lack of development of phenanthroline type and diphenyl amine series of redox indicators together with phenanthronilic acid. Then with more suitable compounds of ceric cerium, accompanied by improved indicators being available commercially, Ce(IV) analytical processes had advanced. Cost of fine-quality cerium reagents had also hindered their quicker development.

Cost had also curtailed student laboratory instruction in the use of cerium reagents, since companion but less valuable reactions, using dichromate or permanganate only cost 10 per cent of the price of cerium oxidants. This, Professor Smith considered, was a shortsighted policy on the part of university and college instructional staffs. In research and control laboratories, reagent cost influences were secondary to improvements in accuracy and in the saving of time. Excellent textbooks on analysis also made no mention of the value of periodate and cerium reagents.

Cerium IV Reagent

One US industry, according to Professor Smith, used cerium IV reagent $(NH_4)_2Ce(NO_3)_6$ and purchased 400 to 500 lb. in periodically duplicated orders, for spectrophotometric estimations and volumetric determination of the hydroxyl group as control procedures in ethylene glycol manufacture. Similar amounts were being used in US arsenal installations.

As an oxidant Ce(IV) had a range of potentials covering the span 1.3 to 1.85 volts. Two most important analytical reagents among Ce(IV) types were ammonium nitrato cerate $(NH_4)_2Ce(NO_3)_6$ and ceric hydroxide, $Ce(OH)_4$. The former was available in the US in standard of reference purity and was about to be included in the standard sample group of volumetric standards by the US Bureau of Standards. $Ce(OH)_4$ was the most popular Ce(IV) reagent for use in the preparation of solutions of sulphato-ceric acid, $H_2Ce(SO_4)_3$ because of its ease of preparation in a high state of purity and its property of being soluble in hot dilute sulphuric acid.

Most versatile of all inorganic analytical reagents was perchloric acid which according to Professor Smith has not yet begun to be utilised elsewhere than the US.

A prominent British reagent supplier only listed perchloric acid as 20 and 60 aqueous solutions. Few textbooks paid attention to perchloric acid and its industrial control analytical potentials were ignored. Reason for this reluctance to utilise perchloric acid in analytical teaching was tacit fear of violent reactions. However, the methods employed had not proved to be disturbing.

Perchloric acid should not only be a non-oxidant when limited in acid strength but it should be a powerful and reactive oxidant and dehydration reactant when hot and in the form of its water azeotrope, 72.5 per cent in composition.

Annual consumption of 70–72 per cent perchloric acid in the State of Ohio alone was estimated at 100,000 lb. Based on this figure a fair estimate for the whole of the US was put at 1.5 million lb. annually. Foreign consumption was beginning to increase and shipments of 1,000 to 2,000 lb. were being sent to Sweden, S. Africa, Australia and Canada. Industries purchasing 70–72 per cent perchloric acid for routine analytical control were iron and steel, and ferrous alloys, leather, cement, fuels, and food industries, which bought in 500-lb. lots.

Uses of Perchloric Acid

Prominent uses of perchloric acid were wet oxidation of organic products prior to trace element determination; fluorine determination, determination of silicon and silica in iron, steel and ferrous alloys, as well as limestone and cement; as a solvent for metal alloys prior to determination of manganese, chromium, vanadium, phosphorus, sulphur, etc.; as an oxidant in determination of chromium in stainless steel, chromium ores, and leather; determination of sulphur in coal and coke as well as zinc, lead and sulphur in the rubber industry; and in titrations of non-aqueous solvents.

New and important analytical control reagents suggested by Professor Smith were tetraphenyl boron, mandelic acid, complex phosphoric and arsenic acid, organic complex compounds, pyridine in Karl Fischer analyses, etc. A British team of research analysts had stressed ethylene diamine tetra-acetic acid as a versatile titrimetric reagent.

All these developments were appropriately associated with the contributions of instrumentation and in conclusion Professor Smith stated that the analyst should always remember that before the click and clack of instrumentation could really become a 'cluck', it had to be provided with wet chemical motivation.

UK Rubber Accelerators

An order has been placed with the Union Oxide and Chemical Co. of London by the Chinese State Trade Organisation in Canton for 15 tons of formerly embargoed rubber accelerators. This is the third order placed by the Canton branch of the Chinese National import and export corporation for rubber accelerators since Britain relaxed trade restrictions against Communist China a month ago. The first two orders went to the Imperial Chemical Industries, China, and the Newmark Company.

SAC Plans Ambitious Programme, Says Dr. Hamence at Congress Dinner

THE Society for Analytical Chemistry is now planning an ambitious programme which it is hoped will cover more aspects of analytical chemistry than has been possible in the past. This was stated by Dr. J. H. Hamence, SAC president, at the congress dinner when he responded to the toast of the society, proposed by Professor G. H. Smith, emeritus professor of chemistry, Illinois University. Dr. Hamence added the hope that in this programme, the society would help industry to increase production and at the same time increase the prestige of analytical chemistry.

The dinner was held at St. Andrews Town Hall and attended by a company of some 330. So large was the attendance that an overflow hall had to be used and speeches were relayed by closed circuit TV.

Congress chairman, Dr. Magnus Pyke, proposed the loyal toast. Dr. A. I. M. Keulemans gave the toast of the Royal Burgh of St. Andrews, emphasising the close connection which the university had in times past with his own country. Provost Fraser replied.

Toast of the university was proposed by Dr. D. Trail, director of the ICI Nobel division research department, who thanked the university staff for the facilities which they had provided for the SAC congress.

Professor A. D. Walsh, professor of chemistry, Queen's College, Dundee, replying to the toast, mentioned well-known chemical personalities who had been associated with St. Andrews. He thought it was appropriate that a conference should be held in that town which had had such a long association with chemistry.

84th Year

Replying to the toast of the society, Dr. Hamence said the SAC was now in its 84th year and he hoped they would have the pleasure of inviting Professor Smith to the centenary celebrations.

He congratulated the Scottish section on the brilliant success of their congress. Not only was the organisation beyond reproach but the papers presented were all of a very high standard. He regarded the congress as a great tribute to the pioneer work which had been carried out by the society during the last decade. The papers presented had shown the enormous strides which had taken place in the development of analytical chemistry during this period. In these spectacular developments the society had played a full and leading part not only in this country but also abroad. The society held meetings all over the country at which these developments were fully discussed; it also published *The Analyst* and more recently *Analytical Abstracts*. The last survey which was made showed that *The Analyst* was now distributed to 58 different countries.

Dr. Hamence went on to say that this work of the society would not have been possible had the society not adopted what could perhaps be described as the 'new look' just after the war. At this time the interest of the society was scarcely adequate to cope with the very rapid developments in the newer branches of analytical chemistry. He would like to pay sincere tribute —on behalf of all concerned with analytical chemistry—to the small body of members who had pioneered the way for the 'new look' and who had made the society conscious of its new responsibilities.

One outcome of this was the formation of the three subject groups, the micro chemistry group (which was originally the Micro Chemical Society) the physical methods group, and the biological methods group.

Clearly industry was now more conscious than at any time in its history of the value of analytical chemistry and the newer methods of analysis were helping analysts to fulfil their task in a way which years ago was impossible. It was gratifying to learn from a recent lecture by Dr. Spence of Harwell of the important part analysis had played in the development of atomic energy.

Discussion on Paper by Mr. A. F. Williams

(See *last week's issue*)

Mr. G. Spencer (Clayton Aniline Co. Ltd.) referred to Scott and Bowman's titration of nitrates. He had used it with platinum and automatic titration techniques. He asked Mr. Williams if the alloy he had mentioned in connection with Scott and Bowman's method was readily available. Was it a better alloy?

Mr. Williams said the alloy was readily available, but not necessarily better.

Mr. Spencer then asked were there nitroso compounds present.

Yes. N-nitroso was present, but it was not particularly stable.

The Chairman of the Session, *Professor D. H. R. Barton*, then asked why was nitrobenzene or nitro compounds so good for separating silanes? Were they more soluble in nitrobenzene?

Dr. A. T. James (Medical Research Council) said they were better as such a polar compound gave reactions with silicon atom.

Hardman and Holden's New Research Laboratories

NEW RESEARCH laboratories were opened last week at Miles Platting, Manchester, for Hardman and Holden Ltd. They have been constructed in an old mill, which offers considerable scope for further expansion. Research staff numbers about 45 out of a total staff of 1,000.

Work at the new laboratories will be devoted to ensuring an even greater use of the chemicals delivered to the firm with the spent iron oxide that is received from gas works.

TRADE NOTES

New Oxygen Station

British Oxygen Gases Ltd., Bridgewater House, Cleveland Row, London SW1, have had plans prepared for the early erection of a new oxygen compressing station at Mosley Road, Stretford, at a cost of £43,000.

Move to Dagenham

London offices and sales depot of Sir W. H. Bailey and Co. Ltd., have moved from 4 Domingo Street, EC1, to new and improved premises erected at Selinas Lane, off Whalebone Lane South, Dagenham, Essex (Telephone: Dominion 2277).

Imports of French Silicone Products

The Board of Trade announce that they are considering an application for the imposition, under the Customs Duties (Dumping and Subsidies) Act, 1957, of an anti-dumping duty on imports of French silicone products of the following description: polymethylsiloxane fluids and emulsions thereof.

Leeds Office Opened

Bastian and Allen Ltd., Ferndale Terrace, Harrow, Middlesex, have opened a branch office at Cabinet Chambers, 20a Basinghall Street, Leeds 1, telephone Leeds 31881, for Yorkshire and Lincolnshire.

Move to Rochdale

On 8 July, James Stott Ltd., formerly of Oldham, move to new offices at Fieldhouse Mills, Rochdale, Lancs.

Scottish Distributors

Chamberlain Industries Ltd. have appointed Hailes Plant Sales and Hire Ltd., 81 Great King Street, Edinburgh 3, and Royal Exchange Buildings, Glasgow C2, as their Scottish distributors and to handle sales of both Jenbach dieseldriven air compressor and Staffa mobile and shop cranes.

Sharples Centrifuges

The address of Sharples Centrifuges Ltd., was incorrectly given on page 1115 of last week's CHEMICAL AGE. This should have read 'Tower Works, Doman Road, Camberley, Surrey'.

British Patent on Bonding PTFE to Rubber

Edison Swan Electric Co. have recently patented in the UK a process for bonding PTFE (polytetrafluoroethylene) plastic to rubber (BP No. 769,093). Operation of the process depends on the embedding of small particles of metal in the surface of the preformed plastic material. The metal particles form a roughened surface which can be used as a gripping surface for the bonding process.

As an alternative to embedding, the metal particles are dissolved with the aid of a selective solvent, which removes the metal, but does not attack the PTFE, thus leaving a pitted surface, capable of gripping the rubber or bonding agent.

In Parliament

ANGLO-US AGREEMENT ON ATOMIC ENERGY INFORMATION

ASKED in the House for details of the agreement with the US on the exchange of information on atomic energy the Prime Minister said that the Atomic Energy Authority is to make available to the US Atomic Energy Commission and to their contractors, details of the Calder Hall reactors, including developments up to 1 January.

Other US firms holding 'access permits' would be able to obtain a 'body of information' which was adequate for the evaluation of the gas-cooled, graphite-moderated power reactor, US firms wishing to go further could negotiate licensing agreements with the industrial groups in this country which had developed designs for commercial nuclear power stations from the basic Calder Hall design.

Toxic Effects of Dressed Seed Corn

Mr. J. B. Godber, joint parliamentary secretary, Ministry of Agriculture, said that post-mortem examinations of dead birds picked up on farms in south-east England this year failed to establish the cause of death. It had not been possible to determine conclusively whether dressed seed corn was responsible. As recommended by the Zuckerman working party, the possible harmful effects of toxic chemicals on birds, animals and wild life generally were being kept under close review.

He had been asked to render illegal the sale of all toxic farm chemicals.

Decrease in Pollution of Rivers

In question time last week, Mr. H. Brooke, Minister of Housing, refuted the charge that pollution of rivers was increasing. The amount of pollution, though very serious, was decreasing.

Mr. Brooke was asked if he would make up his mind about the general contribution of detergents to river pollution and if he would satisfy himself whether the presence of foam-making agents in detergents was really necessary. He said that a technical committee on synthetic detergents was set up early this year; he was sure its report would be of great value.

Fertiliser and Insecticide Research at Rothamsted Station

CHEMICAL subjects are well to the fore in the annual report for 1956 of Rothamsted Experimental Station, Harpenden (250 pp., price 10s, post free), writes our agricultural correspondent. Most of the fertiliser research, however, consists of further instalments in the series of long-term experiments, e.g., placement, effects of different nitrogen rates for new cereal varieties.

The placement experiments have now been completed and it is concluded that lower rates of dressings are superior for potatoes if placed than when broadcast, but this difference in response is not nearly as marked or important when higher rates are given. For beans, phosphatic and potassic fertilisers gave much better results when placed than when broadcast. Further tests on barley have shown twice the response for potash from placed dressings as against broadcast dressings. Wheat of modern varieties, especially hybrid 46, gave large responses to spring nitrogen dressings as high as 4 cwt. per acre of 'Nitro-Chalk', and at two experimental centres maximum yields were not obtained until 8 cwt. per acre of the same fertiliser were given.

A new nitrogen fertiliser is mentioned—formalised casein. It has been tested as a slow-acting fertiliser in field experiments with newly-sown grass, and results have some promise. Whether formalised casein can compete as a slow-acting nitrogenous fertiliser with urea-formaldehyde polymers would seem somewhat doubtful; the source of casein must surely be less expandable than supplies of synthetic urea.

Insecticide research has shown that dieldrin gives good control over wheat bulb fly, but this control gave an appreciable increase in wheat yield at harvest-time only when the dieldrin had been broadcast. Parathion, though giving less effective control, also led to better yields when sprayed late than when sprayed early. Timing and method of application are thus shown to be basic conditions for practical benefits; it is possible, however, that both the broadcast dressing of dieldrin and the late spraying with parathion were controlling some other pest attacking the crop after the bulb-fly season.

Rothamsted's world-famous classical plot experiments have continued, but it is interesting to note that at the Woburn sister-station one of the newest herbicides —TCA or trichloroacetate—has been enlisted to obtain control over twitch (or couch), which infests these very old and perpetually cropped experimental plots. Another partnership between the old and new at Rothamsted is the introduction of an electronic computing machine to deal with experimental data and its statistical assessment.

Priority for Man-Made Fibres in Polish Plans for Chemical Industry

FACTS about a new long-term development plan that will take the Polish chemical industry up to 1970 were given by Mr. A. Radlinski, Polish Minister of the Chemical Industry, at a recent conference held in Warsaw and reported in *Zycie Warszawy* (21 June).

Although Poland has an excellent raw materials base for her chemical industry, in the past the industry's development was slower than that in other industrial fields. Only in 1955 did its rate of development exceed that of other industries, and, although the current five-year economic plan (to end 1960) envisages a doubling of chemical production as against a 50 per cent increase over the rest of industry, Poland will still have considerable leeway to make up in this field.

In discussing the new long-term plan, Mr. Radlinski emphasised economy in use of coal. At present the Polish chemical industry uses 5 million tons of coal a year. By 1960, with doubled chemical production, the industry's coal consumption should be 8 million tons, while in 1970 the coal needs of the chemical industry are likely to be in the region of 13 million tons. Thus the plan envisages an increasing use of brown coal, natural gas and producer gas as substitutes for hard coal.

Up to now the chemical industry has concentrated mainly on sulphuric acid and fertiliser production. An important change of direction will be production of goods direct for the market, as well as for the needs of other industries. Synthetic fibres will take first place in this, followed by fertilisers, which at present account for 30 per cent of the current investment in the industry. The production of nitrate fertilisers will by 1970 have risen from 12 kg. per hectare to 40. Third place will be held by synthetic rubber production and the rubber industry, which should be able by 1970 to cover the requirements of the domestic motor industry. There will also be a big increase in production of dyestuffs and pharmaceutical goods.

In conclusion, Mr. Radlinski stressed the importance of improved training schemes in the industry. The current low level of productivity could be largely ascribed to the general youth and inexperience of chemical workers, rather than to standards of equipment, which were comparable with those of other countries.

DSIR Documents Unit

Documents section of the Technical Information and Documents Unit (TIDU) of the Department of Scientific and Industrial Research has now been merged with the lending library unit and operates from 20 Chester Terrace, Regent's Park, London, NW1. All requests for the loan of documents referred to in TIDU summaries should be addressed to the library unit, and requests for photo-reproductions of those reports and of German documents should be sent to the library unit.

Overseas News

ITALIAN COMPANY TO SUPPLY ELECTROLYSERS FOR NANGAL PLANT

ORONZIO DE NORA, Milan, Italy, have received from the Indian Government an order to supply electrolysers for the Nangal fertiliser and heavy water project.

Vitro Engineering of New York were appointed technical consultants in November, 1956, and eight manufacturers of electrolysers were invited to submit tenders. The contract, valued at $7 million, was awarded to de Nora. Credit facilities satisfactory to both sides have been arranged to finance the order. Delivery will begin in March, 1958, and will be completed by April, 1959.

Some 6,500 cells grouped in sixty electrolysers of the filter press type, each rated at 10,000 amps, will be installed. These will be capable of producing more than 25,000 cubic meters of hydrogen an hour. It is claimed that this plant will be bigger than any other comparable unit completed or under construction anywhere in the world.

Power required by the electrolysers will be approximately 140,000 kW. This will be supplied from the nearby Bhakra Nangal power station which is now nearing completion.

De Nora were able to guarantee a relatively high separation factor for deuterium. This will enable the production of heavy water to be increased above what was originally estimated.

Total cost of the Nangal project will be about $60 million, of which some $45 million will be spent on plant and equipment. The balance will be used to build a small town and to provide water, electricity and other services. The working force is ultimately expected to be over 3,000.

The project is scheduled to be completed by the end of 1959 and full production should be reached by early in 1960. Annual production of nitrogen is expected to be 80,000 tons, in the form of ammonium nitrate and nitro limestone. Production of heavy water is expected to be 15 tons a year.

Other contracts being carried out by de Nora in 1957 include what it is claimed will be the largest chlorine plant in Europe at Mantova, big sulphuric and nitric acid plants in Sicily, the supply of mercury cells to Societe d'Electro-Chimie d'Electro-Metallurgie et des Acieres Electrique d'Ugine and the furnishing of a caustic soda-chlorine plant to Panamericana Textil SA, Sao Paulo, Brazil.

Preparation of Fluorine-containing Compounds

Preparation of new fluorine-containing chemical compounds by the Simon electrochemical process has been investigated by H. C. Brown *et al.*, University of Florida (for Wright Air Development centre). The full report (27 pages) is obtainable, Order PB 121818, from the Office of Technical Services, US Department of Commerce, Washington 25.

Among specific investigations was the preparation of certain simple fluorocarbon sulphides with fluorocarbon olefins. Synthesis and properties of fluorocarbon derivatives having hetero atoms such as oxygen or nitrogen in the principal carbon chain of the molecule have been studied. Other examinations were made of the perfluoramides, and of the synthesis of a possible intermediate of the preparation of the difunctional acid $O(CF_2COOH)_2$.

Krupp to Build Chemical Plant for USSR

Pending the imminent trade negotiations between the German Federal Republic and the Soviet Union, Fried. Krupp, Essen, has obtained a contract for the erection of a chemical plant worth approximately £1,500,000 from the Soviet Union. The plant is for the production of basic materials for a synthetic fibre, probably of the polyester type, and does not include equipment for the spinning process, but it is believed that the order may be extended later to include spinning equipment.

Record Year for Danish Fertilisers

Dansk Svovlsyre og Superphosphat Fabrik, producers of artificial fertilisers, had a record year in 1956. Turnover increased from Kr.345 to Kr.415. Danish agriculture in 1955-56 made record use of fertilisers—1.5 million tons, of which Dansk Svovlsyre supplied two thirds.

Report on Underground Corrosion

Corrosion of metallic structure buried in the ground has been studied by the US National Bureau of Standards and the results have been published in circular 579 available from the Superintendent of Documents, US Government Printing Office, Washington 25, DC, price $3 (Pp. 227, 103 illustrations).

Up to 1922 the studies were confined to corrosion due to stray current electrolysis and its mitigation. After it became apparent that serious corrosion occurred in soils under conditions which precluded stray currents as an explanation, a field burial programme was initiated in order to obtain information pertaining to the effect of soil properties on the corrosion of metals.

Approximately 37,000 samples, or 333 varieties of ferrous and non-ferrous metals, and protective coating materials, were exposed in 128 test locations throughout the US.

UK Atom Plant for Denmark

Britain's fourth export order for nuclear reactors has come from Denmark. Head Wrightson Processes are to supply a heavy water moderated Pluto-type research reactor. Value of the contract is estimated at about £1¼ million.

The reactor which will be similar to the Pluto-type reactors now being built at UK Atomic Energy centres at Harwell and Dounreay will be fuelled with enriched uranium supplied by the UK Atomic Energy Authority. It will be erected at the Rico Atomic Research Centre. Construction of the reactor is due to be completed before the end of 1959.

US Atomic Energy Commission Investigates Fluorine

New fundamental information in the field of fluorine chemistry has resulted from work carried out at Brookhaven and other US Atomic Energy Commission laboratories. The work concerns development studies on fluorination of reactor fuel elements, followed by fractional distillation of the fluoride products.

Brookhaven has developed methods of analysing bromine trifluoride, bromine pentafluoride, uranium hexafluoride and bromine, and is studying the conversion of bromine pentafluoride to bromine trifluoride.

Italian and Austrian Firms' Joint Petrochemical Project

Societa' Montecatini and Osterreichische Stickstoffwerke are jointly floating a new company to build a petrochemical factory in Austria, probably at Lobau, near Vienna, where a refinery is already in operation. The new company will build an additional refinery with a capacity of about two million tons a year.

The new factory will produce mainly plastic materials, including, it is believed, Moplen.

Japan's Export Trade

Japan's export of chemical fertilisers in April, at a value of $7,028,000, were 24.2 per cent up on the March figures. They accounted for 3.1 per cent of the country's total exports state the Japanese Ministry of Finance.

Carbide from Rumania

Carbide is being supplied by Rumania in four grades having the following characteristics

	Type I	Type II	Type III	Type IV
Granulation, in mm.	50–80	25–50	15–25	7–15
Yield of gas (litres of acetylene per kg. carbide at 20°C and 760° mm. Hg.)	280	270	260	250
Phosphorated hydrogen in discharge acetylene, vol. max.	0.05%	0.05%	0.05%	0.05%
Foreign matter	—	—	—	—

The carbide is supplied in sealed drums of 100 kg. net weight.

Large quantities of Rumanian carbide are reported to have been supplied to the USSR, Turkey, Hungary, Lebanon etc. Orders have also been received from the German Federal Republic and the Czechoslovak Republic.

New Petrochemicals Plant for Union Carbide

A major petrochemicals plant is to be built by Union Carbide Corporation in Putnam County, West Virginia. To be completed in 1960, it will be the eighth major chemicals producing plant of the company, which already has two major plants for the production of organic chemicals in the region.

It will provide additional ethylene and propylene, the raw materials for most of Carbide's chemicals. The plant will be designed for the greatest flexibility to meet changes in the market demands for chemicals as they occur in the future. Three of the more important chemicals to be made at this plant are ethanol, ethylene oxide, and isopropanol. The new facilities initially will add 150 million lb. a year to the company's capacity for ethylene oxide production.

Montecatini Build New Plant in Sicily

Societa' Montecatini engineers have begun construction of a factory at Campofranco, Sicily. The factory will process kalinite from the nearby San Cataldo mine to produce potash and other chemicals. Potash produced will be used for the production of potassium fertilisers. A large proportion of it will be sent to Porto Empodocle where Akragas, a company affiliated to Montecatini, is operating a factory manufacturing phosphorus and nitrogen fertilisers.

Output of potash is expected to be 50,000 tons a year (K_2O) which, it is claimed, will be more than sufficient to meet all Italy's needs in potassium fertilisers.

Stripper Tower Handles Acetic Acid Vapours

A stripper tower for handling hot acetic acid vapour contaminated with an oxidising agent has been fabricated by the Offenhauser Co., Houston, Texas, US, and installed in Celanese Corporation's plant at Bishop, Texas.

Nearly two tons of Hastelloy Alloy C made by Haynes Stellite Co., Kokomo, Indiana, were used in the construction. Before construction began, several field tests were carried out to determine the best material and Haynes claim that Hastelloy Alloy C showed the least corrosion of the 10 metals tested.

Record Attendance Expected at World Metallurgical Congress

Record-breaking attendance of at least 650 metal scientists from more than 36 nations is expected at the second world metallurgical congress, sponsored by the American Society for Metals, which will be held in Chicago, Illinois, US, from 2 to 8 November. This estimate is based on mid-May advance registrations which totalled 575 applications from 36 nations.

Biggest delegation is that from Britain with 95 advance registrations. This is closely followed by 88 from Germany, 65 from Japan, 42 from France.

Salt Deposits Reported in NW Jutland

Considerable deposits of salt have been reported in north west Jutland, Denmark. Salt deposits were reserved for the Danish state when the prospecting concession of the Danish American Oil Co. was extended. The deposits are said to be 200 metres down and reasonably easy to mine. No concessions have yet been announced.

Two New Insecticides by S. C. Johnson of America

S. C. Johnson and Son Incorporated of America, have developed two new insecticides, one as a pressurised spray and the other in liquid form, for commercial and institutional use. It is claimed that these products will kill even those insects that have built up resistance to DDT and chlordane. Although non-toxic and harmless to human beings and pets when used as directed, both insecticides contain a higher concentration of synergised pyrethins than Johnson's household products.

Radioactive Waste Dumped in Ground

Some radioactive wastes can safely be dumped in the ground according to scientists at the US Atomic Energy Commission's Hanford plant. Soil conditions in the arid countryside around Hanford in south eastern Washington have made it possible to discharge millions of gallons of liquid waste into the ground.

Results show that some wastes, such as process vessel cooling water, may be discharged to open areas and permitted to seep into the ground, while others must be stored expensively in large underground tanks.

US Enquiry for Chemicals

Mr. S. Mann, President of the Aceto Chemical Co. Inc., 40-44 Lawrence Street, Flushing 54, New York, is anxious to extend his connections by importing all types of chemicals, particularly industrial chemicals, and rubber, including reclaimed rubber. Imports would be for the US firm's own account and payments would be on a letter of credit and/or sight draft basis. Quotations should show both prices in US currency.

Italian Chemical Industry Expansion Rate

Total joint output of all Italian industries during the first four months of 1957 exceeded that of the corresponding period of 1956 by 9.9 per cent. Chemical and allied industries, including petroleum and coal derivatives, cellulose and synthetic textile fibres, however, only increased by about 4 per cent.

The output of rubber decreased by 5.15 per cent.

Du Pont Offer New Polythene Resin

Alathon 31, a polythene resin for use in the manufacture of heavy sheet for thermo-forming is being sold by E. I. du Pont de Nemours. Melt index for Alathon 31 is 0.6 and density is 0.930.

Parts made from Alathon are claimed to have glossy surfaces, to be resistant to environmental stress cracking and to be free of taste or odour. Uses are expected to be in containers for foods such as ice-cream and cottage cheese, and in fabricating trays, covers, liners, lids, shoe components and other items formed from sheet material.

Greek Call for Emulsified Agent of Parathion

Twenty-seven metric tons net weight of active element of parathion under the form of an emulsifiable preparation containing 25 to 50 per cent of active ingredient are required in Greece. This insecticide preparation should consist of: (1) technical parathion, that is of at least 95 per cent O, O-diethyl-o-p-nitrophenyl thiophosphate; (2) suitable solvent for plant spraying; (3) emulgator substance; (4) wetting and sticking materials (eventually). Bids should be sent to the Agricultural Bank of Greece, 23 Venizelos Street, Athens, by 16 July. Photocopies of tender documents (reference ESB/15737/57) can be obtained from the BoT Export Services Branch, Lacon House, London WC1 (Chancery 4411, ext. 738).

Levy for Petroleum Research in Brazil

The Brazilian National Petroleum Council has issued instructions covering the collection from refinerjes of special contributions for petroleum research. It has ruled that 9 per cent due on the c.i.f. price of crude oil imports shall be paid monthly, while the contribution assessed on net profits earned shall be paid yearly.

Soviet Chemical Exports

Soviet exports to Greece under a 1957 protocol to the two countries' agreement include 3,000 tons of cellulose; 10,000 tons of ammonium sulphate; 2,000 tons of sodium carbonate; 2,000 tons of raw naphthalene; and miscellaneous chemical products, dyes, asbestos, asphalt, etc., to the value of US $500,000.

Polystyrene Plant on Stream in India

India's first polystyrene plant, owned by Polychem and set up by Kilachand Devchand and Co., Bombay, in conjunction with the Dow Chemical Co., US, has been brought on stream. Capacity is said to total 6 million lb. of polystyrene moulding powder a year and a polymer processing capacity of between 10 and 12 million lb. It is stated that this will be sufficient to meet India's demands for polystyrene and to leave a small surplus for export.

UK Chemical Exports and Imports for First Five Months of 1957

EXPORTS

		QUANTITY		VALUE	
		Jan./May 1956	Jan./May 1957	Jan./May 1956	Jan./May 1957
INORGANIC					
Acids	Cwt.	79,609	96,306	266,874	296,659
Copper sulphate	Tons	24,074	20,379	2,660,653	1,817,043
Sodium hydroxide	Cwt.	2,407,965	2,240,984	2,977,481	2,763,905
Sodium carbonate	,,	1,958,409	1,991,027	1,212,249	1,370,526
Aluminium oxide	Tons	5,536	12,786	178,668	433,502
Aluminium sulphate	,,	16,832	12,646	244,924	181,911
Other aluminium cpds.	,,	1,491	1,425	60,140	65,977
Ammonia	Cwt.	44,063	36,963	163,159	134,549
Ammonium cpds. (not fertilisers or bromide)	Tons	9,938	8,730	385,376	326,645
Arsenical compounds	,,	1,677	2,260	127,027	158,063
Bismuth compounds	Lb.	130,289	143,618	113,333	121,629
Bleaching powder	Cwt.	172,442	109,183	276,483	192,954
Hydrosulphite	,,	22,640	47,399	177,654	371,814
Other bleaching materials	,,	44,121	57,088	195,859	273,083
Calcium compounds	,,	140,088	144,707	288,623	297,972
Carbon blacks	,,	168,535	327,674	595,863	1,165,396
Cobalt compounds	,,	6,001	5,902	277,512	228,853
Iron oxides (chemically manufactured)	,,	39,610	41,930	134,566	127,954
Lead compounds	,,	19,162	18,481	130,173	121,111
Magnesium cpds. (nes)	Tons	5,893	7,378	297,632	360,060
Nickel salts	Cwt.	28,923	38,279	272,727	418,497
Potassium cpds. (not fertilisers or bromides)	,,	24,090	23,790	231,485	251,941
Sodium bicarbonate	,,	294,421	314,065	260,310	287,193
Sodium phosphate	,,	28,114	54,663	135,455	248,219
Sodium silicate	,,	163,477	145,699	141,654	130,550
Other sodium cpds.	,,	672,596	612,805	1,533,644	1,601,535
Tin oxide	,,	2,663	4,231	101,016	154,298
Zinc oxide	Tons	2,551	2,833	204,754	194,467
Other inorganics (nes)		—	—	2,001,563	2,092,728
ORGANIC					
Acids, anhydrides, salts & esters		—	—	566,009	542,487
Glycerine	Cwt.	30,034	40,326	331,838	372,708
Ethyl, methyl, etc., alcohols & mixtures (nes)		—	—	533,664	538,154
Acetone	Cwt.	72,284	74,249	175,612	232,302
Citric acid	,,	14,287	24,335	142,068	234,094
Gases, compressed, liquid or solid (nes)		—	—	452,548	865,807
Phenol	Cwt	43,496	57,831	266,381	378,007
Salicylates	Lb.	328,586	523,463	90,073	156,762
Sodium compounds	Cwt.	11,056	13,341	124,367	176,358
Sulphonamides, not prepared	Lb.	723,558	524,410	375,714	365,536
Dyestuffs intermediates	Cwt.	33,564	42,032	632,238	600,182
Organic compounds (nes)		—	—	5,710,445	6,863,647
Total elements & cpds.		—	—	**25,047,814**	**27,565,078**
Coal tar	Tons	51,824	41,030	457,228	427,057
Cresylic acid	Gall.	1,273,965	1,511,959	405,275	560,508
Benzol	,,	340,898	10,098	65,084	4,395
Creosote oil	,,	7,046,386	7,102,300	465,070	489,485
Other mineral tar & crude chems. from coal, petroleum & nat. gas	Cwt.	139,290	99,090	312,957	222,614
Pigment dyestuffs	,,	10,464	11,830	444,307	471,990
Other syn. dyestuffs & cpds.	,,	77,579	89,664	3,530,966	4,155,861
Synthetic org. pigments	,,	9,822	11,139	342,201	434,468
Veg. & animal dyeing extracts	,,	1,663	1,915	60,781	53,381
Tanning extracts	,,	51,328	63,554	229,387	287,381
Pigments, paints & varnishes		—	—	9,580,228	10,342,774
Drugs, medicines, etc.		—	—	14,850,076	16,754,302
FERTILISERS					
Ammonium nitrate	Tons	2,438	518	77,726	17,204
Ammonium sulphate	,,	17,436	17,237	336,612	313,643
Phosphatic and potassic		—	—	28,507	38,131
All manufactured fertilisers		—	—	222,625	217,902
Explosives		—	—	4,866,475	4,512,036
Insecticides, fungicides & rodenticides	Cwt.	181,305	161,457	1,965,257	2,013,447
Weedkillers	,,	46,770	59,479	547,527	612,605
Carbons, decolorising or activated	,,	37,328	32,952	158,776	141,429
Tetra-ethyl lead anti-knock compound	Gall.	1,868,504	2,346,699	3,964,349	5,113,425
PLASTICS MATERIALS					
Phenol & cresol formaldehyde resins	Cwt.	25,693	27,985	183,272	198,004
Urea formaldehyde resins	,,	113,043	102,823	531,231	524,453
Vinyl resins, unplasticised	,,	66,557	81,836	680,871	715,962
Vinyl resins, plasticised	,,	44,068	46,939	592,271	580,420
Other vinyl resins	,,	75,875	93,603	960,265	1,231,330
Moulding powders	,,	301,540	409,192	3,845,396	5,413,479
Sheet, rod, tube, film & foil		118,690	119,309	3,610,648	3,569,287

IMPORTS

		QUANTITY		VALUE	
		Jan./May 1956	Jan./May 1957	Jan./May 1956	Jan./May 1957
INORGANIC					
Acids	Cwt.	33,857	34,852	98,480	103,371
Abrasives, artificial—					
Aluminium oxide—					
Crude, unground	Tons	10,029	6,112	518,677	328,273
Ground or graded	,,	1,600	1,292	168,856	144,658
Silicon carbide	,,	6,482	3,658	632,243	364,129
Arsenic trioxide	,,	3,356	2,180	117,202	67,858
Borax, refined	Cwt.	190,109	211,734	354,601	415,828
Calcium carbide	,,	342,155	403,594	632,931	753,287
Carbon black (channel)	,,	74,016	87,152	427,743	506,581
Other carbon black (not acetylene black)	,,	48,177	34,482	186,521	132,347
Cobalt oxides	,,	4,206	2,592	263,119	162,089
Iodine	Lb.	270,093	597,259	136,143	230,078
Mercury	,,	472,080	583,566	528,900	646,773
Sodium, calcium, potassium, lithium	Cwt.	32,146	15,087	506,422	121,508
Potassium cpds. (not fertilisers)	,,	32,427	45,445	156,587	209,125
Selenium	Lb.	86,325	77,754	458,983	405,423
Silicon	Tons	2,886	2,167	421,032	348,510
Sodium chlorate	Cwt.	49,727	48,135	151,896	160,385
Sodium phosphate	,,	16,248	2,047	73,542	13,387
Other sodium cpds.	,,	138,617	138,814	577,838	491,199
Inorganic chemicals (nes)		—	—	1,094,981	1,390,499
ORGANIC					
Acids, anhydrides and their salts and esters		—	—	700,501	736,798
Glycerine	Cwt.	46,406	44,969	359,711	278,434
Menthol	Lb.	28,513	88,192	59,006	185,842
Naphtha, methyl alcohol & alcohol mixtures		—	—	936,479	795,412
Turpentine	Gall.	175,342	89,285	48,203	24,243
Glycol ethers & esters	Lb.	3,500,864	2,684,044	296,187	257,905
Sodium cpds.	Cwt.	51,385	69,062	510,230	671,164
Styrene (monomeric)	Gall.	1,746,423	312,472	952,139	170,758
Vinyl acetate (monom)	Tons	3,811	2,105	553,408	245,628
Dyestuffs intermediates	Cwt.	3,691	13,126	193,735	423,346
Organic cpds. (nes)		—	—	5,785,759	4,704,921
Dyeing extracts	Cwt.	6,719	8,558	45,135	61,632
Tanning extracts (inc. tit. dioxide)	,,	29,753	36,149	310,051	362,550
Other pigments, paints, etc.		—	—	255,812	364,984
Vitamins, their salts & esters		—	—	653,458	467,828
Antibiotics		—	—	272,963	453,312
Alkaloids		—	—	504,571	279,949
FERTILISERS & OTHERS					
Basic slag	Tons	43,005	51,879	340,132	422,336
Disinfectants, insecticides, weedkillers, sheep & cattle dressings	Cwt.	15,117	15,651	483,562	592,755
Potassium chloride	,,	5,356,763	4,508,232	4,381,583	3,857,477
Potassium sulphate	,,	137,145	123,031	138,897	126,947
Other fertilisers		—	—	972,787	1,042,630
PLASTICS MATERIALS					
Vinyl resins	Cwt.	59,875	60,231	860,145	848,050
Other syn. resins	,,	64,067	109,320	928,871	1,526,266
Moulding powders—					
Polystyrene	,,	2,297	3,828	29,837	51,812
All other	,,	13,239	17,718	231,221	259,073

EXPORTS OF CHEMICALS TO PRINCIPAL MARKETS

	Jan./May 1955	Jan./May 1956	Jan./May 1957
	£	£	£
Nigeria	2,036,405	2,352,569	2,152,739
Union of South Africa	5,159,175	5,594,761	5,264,432
Rhodesia and Nyasaland	933,491	958,333	1,227,781
India	6,858,249	8,376,664	8,679,060
Pakistan	1,436,036	1,452,216	1,422,114
Singapore	1,690,877	1,801,663	1,912,649
Malaya	1,424,900	1,542,021	1,674,152
Hong Kong	1,567,959	1,430,657	1,989,354
Australia	8,175,429	7,635,309	8,482,552
New Zealand	3,398,724	2,944,056	3,152,913
Canada	2,735,985	3,154,762	3,418,362
Jamaica	926,181	1,083,427	1,060,695
Irish Republic	2,827,659	2,842,287	2,619,047
Finland	1,347,988	1,321,658	1,148,526
Sweden	2,649,162	2,632,531	3,252,063
Norway	1,608,492	1,504,798	1,757,441
Denmark	1,705,721	1,770,152	2,077,053
Poland	292,098	186,551	379,807
Western Germany	2,351,256	2,389,574	3,457,992
Netherlands	3,071,746	3,735,030	4,038,507
Belgium	2,237,525	2,338,412	2,946,254
France	3,352,630	2,784,616	4,428,460
Switzerland	1,198,753	1,350,263	1,480,134
Portugal	803,243	978,059	1,246,462
Italy	2,602,890	3,426,759	4,171,807
Turkey	618,862	812,747	441,424
Netherlands Antilles	1,476,108	1,061,714	1,502,302
Egypt	1,615,900	1,919,641	5,835
Iraq	977,951	1,131,488	1,215,479
Indonesia	1,332,430	1,248,030	1,350,461
China	1,107,328	287,339	883,462
Japan	530,013	738,463	1,142,291
United States of America	3,297,824	3,753,813	3,264,435
Argentine Republic	2,650,560	1,137,591	2,076,580
Other foreign countries	1,017,809	1,393,713	1,884,514

PEOPLE in the news

● MR. D. G. KINGWILL, chief liaison officer of the Council for Scientific and Industrial Research, has been seconded to the Federal Government of Rhodesia and Nyasaland until the end of this year. He will advise on the co-ordination and development of research services. One of his duties will be to consider whether the establishment of a research council is practicable, how it could best be organised and how it should be financed.

● MR. H. A. LUSS has been appointed chairman of the nuclear group of the Scientific Instrument Makers' Association from 6 July. Mr. Luss, who is at present joint managing director of Isotope Developments Ltd., Beenham Grange, Aldermaston Wharf, near Reading, and 120 Moorgate, London EC2, has also been appointed deputy chairman of the company.

● MR. A. W. MARSDEN, M.Sc., F.R.I.C., director of the Commonwealth Bureau of Dairy Science and Technology at Shinfield, Reading, has been appointed organising secretary of the 15th international dairy congress to be held in London from 29 June to 3 July next year. MR. E. J. MANN, N.D.D., assistant director of the bureau, has been appointed acting director.

● Foxboro-Yoxall Ltd. will shortly open their new factory at Redhill, Surrey, and are now engaged in a reorganisation and expansion of the staff. First appointments to be announced are:

Mr. Balls

Mr. Isaac

MR. B. W. BALLS, B.Sc., M.I.CHEM.E., to be technical sales manager and MR. A. H ISAAC, B.Sc., A.M.I.CHEM.E., to be manager of the sales engineering department.

● After four years as manager of the Bearpark (Durham) by-product plant of the National Coal Board, MR. ARTHUR TAYLOR has retired. Mr. Taylor started his career at Bankfoot Works, Crook, where he became assistant manager. He continued in this position until 1953 when he was appointed to Bearpark as manager.

● MR. H. M. RILEY, works manager, W. J. Bush and Co. Ltd., chemical manufacturers, Widnes, acting on medical advice, retires from the company at the end of this month. The directors have recorded their appreciation of his services to the company. MR. J. F. G. WYNNE, B.Sc., who has 34 years' service, has been appointed manager of the Widnes works, and in the conduct of his responsibilities will remain closely associated with MR. A. A. ARNOLD, chief engineer.

● MR. I. D. DAVIDSON, C.B.E., has been appointed to the boards of the Shell Petroleum Co. Ltd. and NV De Bataafsche Petroleum Maatschappij.

● After 30 years service with R. W. Greeff and Co., MR. R. J. HELFENSTEIN is to leave the company. He has resigned his directorships of Greeff-Chemicals Holdings and of R. W. Greeff. Mr. Helfenstein is shortly taking up an appointment in Switzerland with Dow Chemicals International, Zurich.

● COLONEL D. G. N. LLOYD-LOWELS has been appointed chairman of the Amber group of companies, of which he has been a director. He succeeds the late Mr. Arthur Mortimer. MR. G. C. BAKER, group secretary, has been appointed a director of Amber Chemical Industries.

● MR. D. CURTIS, development director of Quickfit and Quartz Ltd., manufacturers of interchangeable laboratory glassware, Stone, Staffs, has been elected to the council of the Society of Glass Technology.

● MR. CHESTER H. GOODWIN has been appointed project manager for Chemstrand Ltd.'s new Acrilan acrylic fibre plant now being constructed at Coleraine, Northern Ireland. Mr. Goodwin is moving over from the Chemstrand Corp. plant at Decatur, Alabama, to take up this appointment on 16 July.

● MR. ROBERT M. BRINEY has been appointed president of Haynes Stellite Co., Division of Union Carbide Corp. Mr. Briney started with the Corporation in 1924 in the Niagara Falls, NY, plant of Electro Metallurgical Co., a division of Union Carbide. He has held key positions with that division both in production and development at Niagara, as well as at Alloy, W. Va., and New York. In 1950, he was made vice-president in charge of wrought alloy products for Haynes Stellite Co. in Kokomo, Ind., and was transferred to the New York office of that division in July 1954.

● The DR. ROBERTS mentioned in the paper presented by DR. E. B. HUGHES, chief chemist, J. Lyons and Co. Ltd., at the SAC congress last week works for the Indian Tea Association at their London laboratory and not with J. Lyons as stated in CHEMICAL AGE last week.

● MR. I. M. O. HUTCHISON, joint managing director of the Balfour Group, has just flown to America for a short goodwill tour. He will stay in New York for about nine days, to follow up enquiries, meet established and potential clients, and generally survey the market. He then travels to Rochester, to attend the annual meeting of the Pfaudler Company. Next Mr. Hutchison flies to Toronto to discuss policy and general business matters with Dominion, Scott, Barron Ltd. a subsidiary company of the Balfour Group, working on the design and manufacture, in Canada, of the plant of George Scott and Son (London) Ltd. and W. S. Barron and Son Ltd. of Gloucester. He hopes wherever possible, to meet customers and deal personally with on-the-spot enquiries.

Mr Hutchison

Fulmer develop new method of titanium production

A NEW METHOD for the production of titanium, which is claimed to make possible the use of more readily accessible raw materials, has been developed at the Fulmer Research Institute.

The basic principle is simple. Titanium tetrachloride is passed over a heated titanium alloy when the following reaction takes place:

$$3TiCl_4 + Ti \rightarrow 4TiCl_3 \rightarrow 2TiCl_2 + 2TiCl_4$$

The $TiCl_2$ then disproportionates to give titanium and $TiCl_4$.

$$2TiCl_2 \rightarrow Ti + TiCl_4$$

A possible starting material is ferro-titanium formed by the reduction of ilmenite. The process is continuous and theoretically there is no loss of titanium tetrachloride. In addition to being a refining process, the method could be used to recover scrap titanium.

At present, the method is only in the laboratory stage and the sponsors are seeking a licensee who will carry out pilot plant development.

Open Day at the Fulmer Research Institute was held on 2 July. About 200 visitors were present, representing all fields of industry. A fuller report will appear in next week's issue.

Commercial News

Boake Roberts will Finance Expansion with New Capital

GROUP trading profits of A. Boake Roberts and Co. (Holdings) Ltd. for the year ended 31 March were £336,241 (£628,430). Dividend is maintained at 15 per cent, but last year's 2½ per cent bonus is not repeated. The drop in profits is recorded despite a recovery in trading conditions during the second half of the year. Export sales increased, but profit margins suffered, while UK sales were slightly lower.

Mr. F. G. Pentecost, chairman, says that no substantial improvement in profits is anticipated for the current year, despite provision for high sales. He adds that profit margins may well shrink further. If the UK joins the projected European free trade area, the company will have the opportunity of expanding its sales but will have to compete on equal terms with continental manufacturers.

During the year, the company spent £455,442 on fixed assets, of which the major part was in respect of the new Widnes site. A big capital programme, with commitments estimated at £296,000 (£571,000), has still to be faced. It is proposed to raise borrowing limits to the issued capital and reserves. If approved, £600,000 will be raised by a debenture issue. More finance will be required later to pay for further development, both at home and overseas.

Annual meeting will be held at Grosvenor House, London W, on 19 July at noon.

APV Co.

Group net profits for the APV Co., chemical plant manufacturers, Crawley, in 1956 totalled £101,328 (£121,906). The parent company's net profit was £41,498 (£78,063). No dividend is to be paid on ordinary (10 per cent in 1955). Annual meeting will be held at Crawley on 25 July at 11 a.m.

Dr. R. J. S. Seligman, chairman, described 1956 as a disappointing year. Group turnover, excluding inter-group sales, was not materially altered at nearly £6 million, but rising costs and falling profit margins resulted in the reduced profit. In the early months of this year, intake of new business continued inadequate, but Dr. Seligman reported a marked improvement in more recent weeks, including some substantial contracts.

British Glues and Chemicals

Group net profits of British Glues and Chemicals for the year ended 31 March 1957 were £359,547 (£388,065), before tax of £381,000 (£351,000). Dividend of 18½ per cent (equivalent of 15½ per cent) is declared.

Amber Chemical Industries

In view of the 1956 results, no payment of any part of arrears of preference dividend can be made at present. Arrears date from 1 January 1953.

Fielden Electronics

A major holding in Fielden Electronics Ltd., Wythenshawe, has been purchased by Hopkinsons Ltd., manufacturers of boiler fittings and controls, Huddersfield. Mr. J. E. Fielden, founder of Fielden Electronics, retains a substantial shareholding and continues as chairman and managing director. At the recent annual meeting he said that the new association would provide the necessary finances for the continued expansion of the company in the instrument field.

Gas Purification

The Gas Purification and Chemical Co. has obtained CIC consent to the formation of a new company, Amphenol (Great Britain) Ltd. with a fully paid share capital of £100,000. Half of this will be subscribed by Gas Purification and half by Amphenol Electronics Corporation, Chicago, US.

Greeff-Chemicals

Trading to date this year of Greeff-Chemicals Holdings Ltd is on a slightly higher level than for the same period of 1956, but expenses continue to increase and trading conditions remain difficult. This was stated by Mr. Stanley Bayliss Smith, chairman, at the recent annual meeting. Mr. Smith said that the company now dealt in more than 600 different chemicals, while stocks held comprised no less than 200 of those products.

Hardman and Holden Ltd.

Net profit of Hardman and Holden Ltd., Manchester, for the year ended 31 March was £122,769 and not £112,769 as stated in 'Commercial News' last week.

Johnson Matthey and Co.

Group net profit of Johnson Matthey and Co., refiners of gold, silver and platinum, for 1956 was £945,498 (£1,032,747) after providing £871,207 (£1,004,463) for tax. Final dividend of 7 per cent, making 10 per cent (9 per cent) is announced.

Howards and Sons Ltd., Ilford

Group profit for Howards and Sons for 1956 was £47,449, compared with £39,852 for 1955. Taxation amounted to £20,443 (£31,416). This group profit has been arrived at after crediting prior year adjustments amounting to £4,632 (nil) in respect of insurance recoveries and £8,787 (£10,600) in respect of taxation, but before taking into account a special provision of £116,000 out of general reserve for obsolescence of buildings and plant.

The taxation is arrived at after taking into account the prior year taxation adjustments referred to above.

Morgan Crucible Co. Ltd.

Due to modest price increases the total value of sales income was 4 per cent in excess of the previous year. There was, however, a shrinkage in profit margins which explains the decline in group trading profits from £2,113,764 to £1,917,175. The dividend of 10 per cent is as before but there is an additional 1 per cent centenary bonus.

Capital expenditure of the company totalled £1,475,000 in the year ended 31 March last, because of additional projects initiated principally by subsidiaries, Mr. P. Lindsay, chairman, reports. Disbursements on capital plant have resulted in an increase in net fixed assets of £1,075,000 of which £282,000 comes from new ventures. Investments on these in 1957–58 are estimated at a further £300,000.

One new project of the company is the large-scale machining of high purity graphite for use in nuclear power plants. Shortage of technologists is still persistent the chairman reports, despite efforts to provide training facilities within industry.

INCREASES OF CAPITAL

MAY AND BAKER LTD., Dagenham, Essex. Increased by £2,000,000 beyond the registered capital of £3,037,500.

SANDOZ PRODUCTS LTD., Bush Lane House, Bush Lane, London EC4. Increased by £60,000 beyond the registered capital of £740,000.

CHANGE OF NAME

GARDINOL CHEMICAL CO. LTD., 78-80 New Street, Milnsbridge, Huddersfield, changed to Ronsheim and Moore Ltd.

NEW COMPANIES

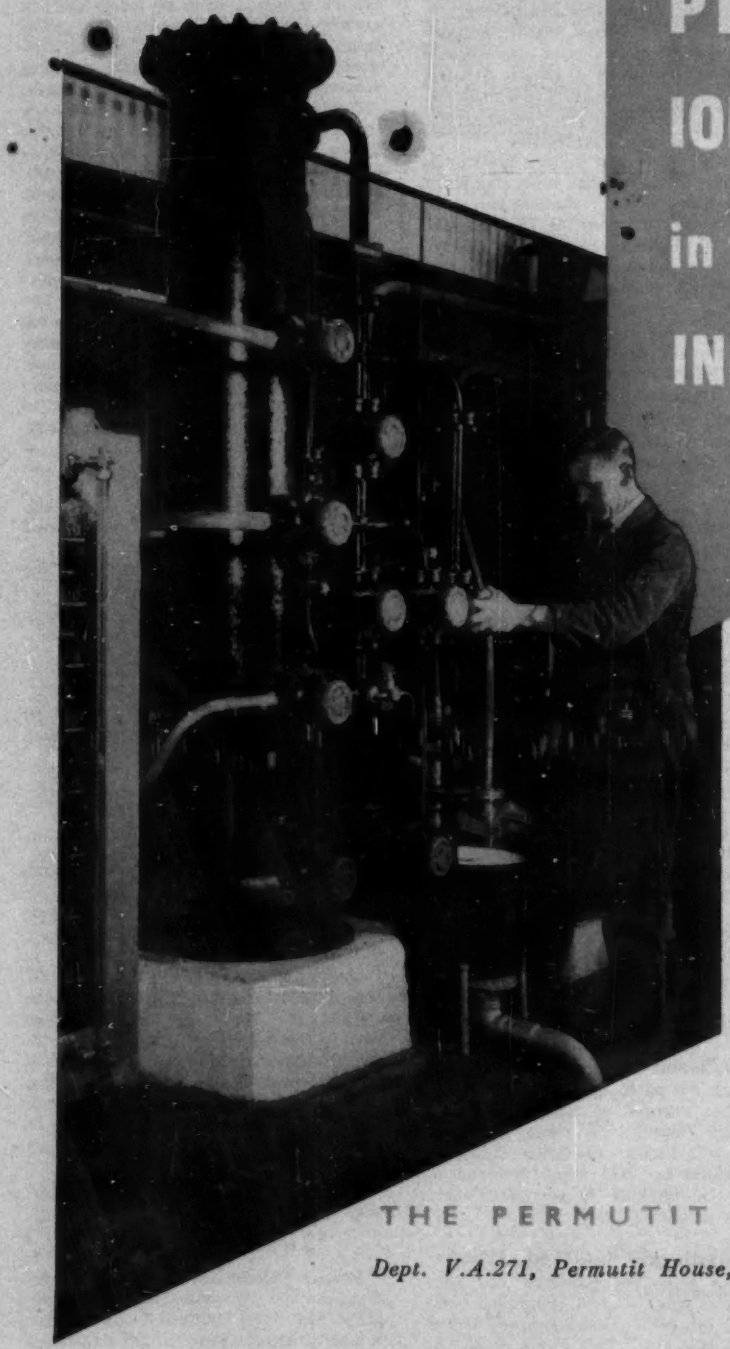
BALFOUR LABORATORIES LTD. Cap. £1,000. Wholesale or retail manufacturing, pharmaceutical, consulting, analytical and general chemists etc. Directors: D. S. and K. Parr, and N. and E. Calverley. Reg. office: 13 Industry Road, Sheffield 9.

SOUTHERN CHEMICAL PLANT CO. LTD. Cap. £100. Consulting chemists, consulting chemical engineers, consultants and advisers on all matters appertaining to the manufacture, composition and use of chemical substances, heavy and fine chemicals, organic and inorganic compounds etc. Directors: M. A. and H. M. M. Phillips. Reg. office: 56-60 Islington Park Street, London N1.

LONDON GAZETTE

Winding up petition

METALLO-CHEMICAL REFINING CO. LTD. A petition for the winding up of this company has been presented by Societe Anonyme Belgo-Chimie, and is directed to be heard at the Royal Courts of Justice, Strand, London WC2 on 8 July.



PERMUTIT ION EXCHANGE in the CHEMICAL INDUSTRY

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NEW PATENTS

By permission of the Controller, HM Stationery Office, the following extracts are reproduced from the 'Official Journal (Patents),' which is available from the Patent Office (Sale Branch), 25 Southampton Buildings, Chancery Lane, London WC2, price 2s 6d including postage; annual subscription £6 6d.

Specifications filed in connection with the acceptances in the following list will be open to public inspection on the dates shown. Opposition to the grant of a patent on any of the applications listed may be lodged by filing patents form 12 at any time within the prescribed period.

ACCEPTANCES

Open to public inspection on 21 August

Extraction of uranium compounds. Arden, T. V., Burstall, F. H., and Linstead, R. P. **781 721**

Manufacture of silver azide. Minjstry of Supply. [Cognate application 29 665, Nov. 19, 1949.] **781 440**

Polymeric organo-tin mercapto compounds and synthetic resins. Carlisle Chemical Works, Inc. **781 452**

Method of and means for measuring the staple length of fibres. British Cotton Industry Research Association. **781 453**

Production of aralkyl carboxylic acids and amides and thioamides thereof. British Petroleum Co., Ltd., McLean, A., Habeshaw, J., Oldham, W. J., and Wirth, M. M. **781 454**

Nuclear reactors. UK Atomic Energy Authority. **781 648**

Hydrazine compound and a process for making it. Ciba Ltd. [Addition to 654 821.] **781 456**

Drier compositions for use in coating compositions containing drying oils and/or synthetic resins. Carlisle Chemical Works, Inc. **781 449**

Manufacture of derivatives of natural and synthetic rubber. Hilton, F. **781 425**

Derivatives of unsaturated animal and vegetable oils. Hilton, F. [Divided out of 781 425.] **781 426**

Method of improving the bonding properties of solid polythene plastic materials. British Cellophane, Ltd. **781 467**

Process for the refining of naphthenic acids by distillatjon. Universal Oil Co., Ltd. **781 578**

Apparatus for determining the colour temperature of a source of light. Gossen & Co. Ges., P. **781 564**

Rigid polyester-urethane thermoplastics. Goodrich Co., B. F. **781 469**

Pest control agents. Sandoz, Ltd. **781 471**

Method of preparing a combined nickel oxide-tungsten oxide catalyst. Gulf Research & Development Co. **781 583**

Preparation of carbon-substituted piperazines. Wyandotte Chemicals Corporation. **781 701**

Process for removal of cations from aqueous solution. UK Atomic Energy Authority. **781 726**

Devices for measuring speeds of flow of gaseous or liquid media. Studienges. Kohle, formerly Studienund Verwertungsges. **781 590**

Polyureas and process for making them. Ciba Ltd. **781 479**

Production of lactams. Whiffen & Sons, Ltd. **781 380**

Condensing apparatus for vacuum treatment plant. Buhler, Ges. **781 728**

Disazo-dyestuffs and process for making them. Ciba Ltd. **781 484**

Methods for the separation of solutes by partition. Fisons Pest Control, Ltd. **781 485**

m-Substituted ethyl thiolbenzoates. Imperial Chemical Industries, Ltd. **781 381**

Herbicides and herbicidal compositions. Monsarto Chemical Co. **781 702**

Device for ascertaining the ability of a fabric or of a colour paint to withstand bleaching. Quarzlampen Ges. **781 598**

Basic esters, their acid salts and quaternary salts. Cilag, Ltd. **781 382**

Organopoly-siloxane compositions. General Electric Co. **781 488**

Method for the coating of fibrous materials such as glass threads with synthetic resin. Institut Textile De France. **781 489**

Salts of hydrazine. Genatosan, Ltd. **781 491**

Dyestuffs of the oxazine series and process for making them. Ciba Ltd. **781 384**

Process for the production of tetra-azoporphin dyestuffs. Farbenfabriken Bayer AG. **781 499**

Metal powder bodies. Cohen Sinteel, Ltd., G. **781 433**

Production of polymers of ethylene. Monsanto Chemical Co. **781 421**

Omega-haloalkyl quaternary ammonium salts and preparation thereof. Irwin, Neisler & Co. **781 502**

Process for the manufacture of defluorinated phosphatic materials. International Minerals & Chemicals Corporation. **781 504**

Hydrocracking and hydrodesulphurizing crude petroleum oils containing sulphur. Gulf Research & Development Co. **781 706**

Polymers prepared from acrylonitrile. Kodak, Ltd. **781 434 781 435 781 436 781 437**

Productjon of polyamides. Courtaulds, Ltd. **781 510**

Disinfectant composition. Diversey Corporation. **781 708 781 730**

Phenolic resin plywood glues. Monsanto Chemicals, Ltd. **781 731**

Paper composed of fibres of p.t.f.e. and other closely related polymers. Du Pont De Nemours & Co.; E. I. **781 512**

Tubular heat-exchange apparatus. Serck Radiators, Ltd. **781 332**

Preparation of 3-(2-amino-ethyl)-indoles. Upjohn Co. **781 390**

Method for the production of p-xylene. Esso Research & Engineering Co. **781 732**

Market Reports

PRICE RISES EXPECTED END-JULY

LONDON Home trading conditions on the industrial chemicals market remain fairly active notwithstanding a seasonal quietness associated with some of the main consuming industries. The overseas demand continues good.

The beginning of the new season has witnessed a fair demand for the compound and concentrated fertilisers, quotations for which continue unchanged. The price position for the general run of chemicals remains unaltered but the undertone is firm and some price increases before the end of the month would not be unexpected.

Creosote oil, phenol and the cresylic acids are moving steadily in the coal-tar products market and there is a fair enquiry for the light distillates.

MANCHESTER Again making due allowance for the effects of holiday stoppages at consuming works the call for contract deliveries of heavy chemicals on the Manchester market during the past week has been on study lines, with replacement buying as need arises. Shippers' enquiries have been on a fair scale. Quotations for the non-ferrous metal compounds are fluctuating with the movements in the metals, but otherwise the undertone of the market is firm. Quiet conditions continue to rule in the fertiliser trade. The demand for most of the light and heavy tar products seems to have been well maintained.

GLASGOW Another good week's trading is reported from practically all sections of the Scottish market, with the off-take against spot and contract keeping up to the demand of the last two to three weeks. Prices have been more or less steady, although intimation has been received of price changes in some of the basic chemicals. Agricultural demand has been more or less what one would expect although the continued dry spell has caused a falling off in demand for certain chemicals. Export continues to be active and some interesting enquiries have been received.

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COMPANY IN PONTEFRACT AREA, manufacturing chemicals for Plastics Industry, has vacancy for **CHEMIST** for process control work. Applicants should be graduates or members of the Institute of Chemistry. Salary in accordance with experience and qualifications. Box No. 3549.

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COMPANY IN THE WEST RIDING OF YORKSHIRE, engaged in the manufacture of Chemicals for the Plastics Industry, requires a **PERSONAL ASSISTANT** to the Technical Director. The position offers excellent prospects. Applicants should be at least 30 years of age, should hold an Honours Degree in Chemistry or its equivalent, and have had some industrial experience. Salary in accordance with qualifications and experience. Please send full details to Box No. 3551.

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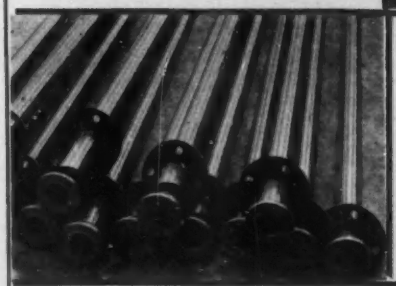

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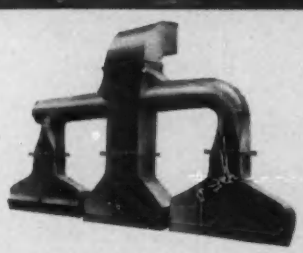

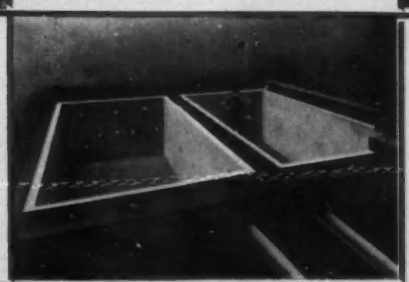

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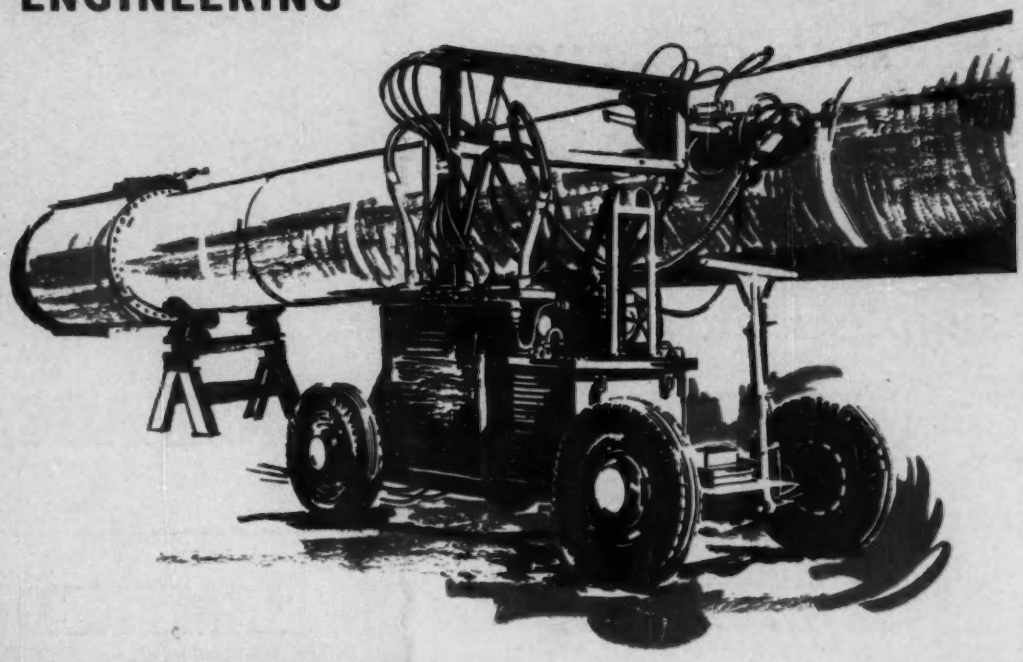

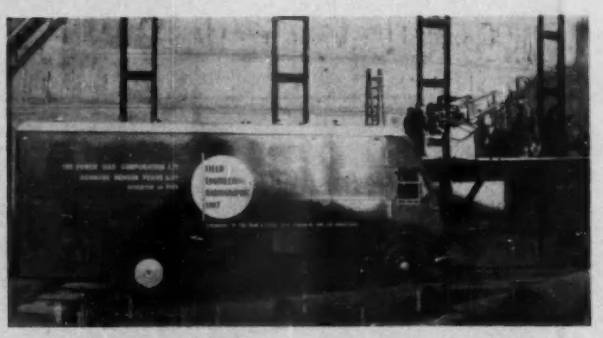

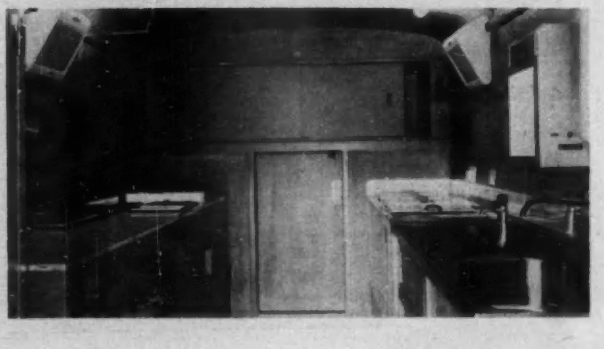

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